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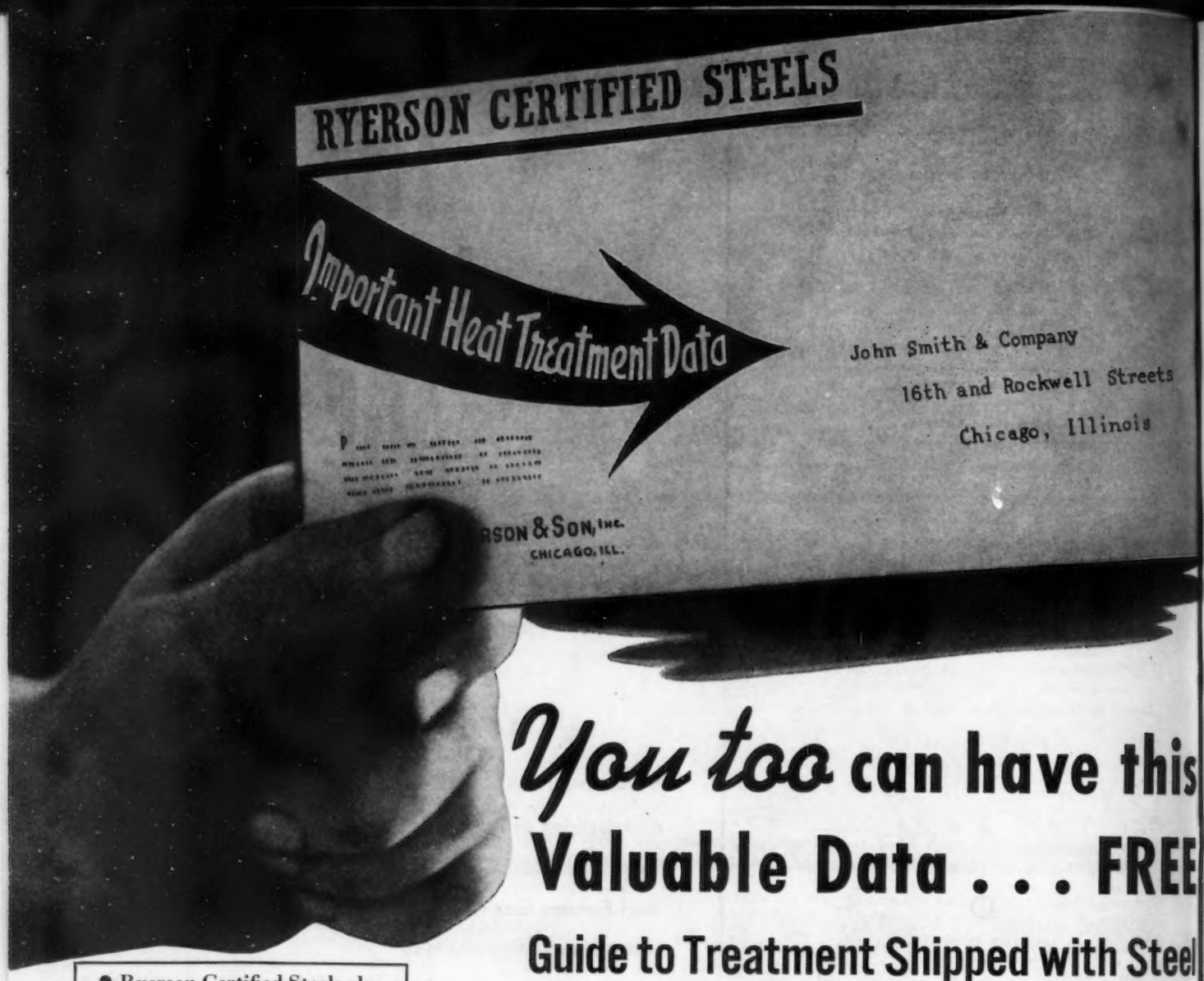

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AUGUST 31, 1939

ESTABLISHED 1855 Vol. 144, No. 9

No Quarter!

FOR some time American business has had a suspicion that it is not over-popular with the New Deal Administration. (Please note that this term excludes the "honest to goodness" Democrats, many of whom are business men themselves and have to make a profit or meet a payroll.)

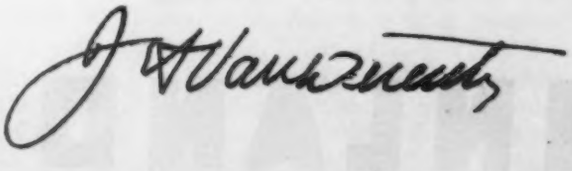
Indeed, many business men who have listened to appeals for cooperation and have repeatedly grabbed the administrative olive branch, only to find it turn into poison ivy, may have wondered whether there was something about themselves that even their best friends hesitated to mention that would cause such a nose lifting and turning away after each get-together. It may be reassuring to a great many business men and industrialists who have had this experience to learn that the trouble is not halitosis or "BO" but something far removed from business and business men, in fact something that has never had anything to do with business. The trouble, generically speaking, is "Tommy the Cork" as the President playfully calls his closest adviser and most powerful composer of New Deal strategy and policy, Thomas Corcoran.

Tommy the Cork, as you know, is the head chef of the unofficial yet apparently all-powerful kitchen cabinet. He and his fellow amateur but ambitious cooks—there are quite a number of them—comprise the brain trust, or rather what remains of it after so much of the brains have resigned. It is this group that mixes the purges for unruly Congressmen and that stirs up the nauseous messes that business is asked to swallow for its "health."

Dr. Raymond Moley, original brain truster, tells us the inside story in a revealing series now running in the *Saturday Evening Post.* Most amazing of all is the attitude of present chief brain truster Corcoran toward business as revealed in a remark made by him to Dr. Moley. In effect, as reported by Dr. Moley, this was: "When you are fighting with a business man or a 'Polack,' you can give no quarter."

Why the chief New Deal adviser should add the Poles to the list of those who should receive no quarter, it is hard to say, especially since there are several million good American voters of Polish birth or descent who will remember this remark next election day.

As for the business men, very few indeed are optimistic enough to hope for any quarter from Tommy the Cork or even a thin dime from the whole New Deal.



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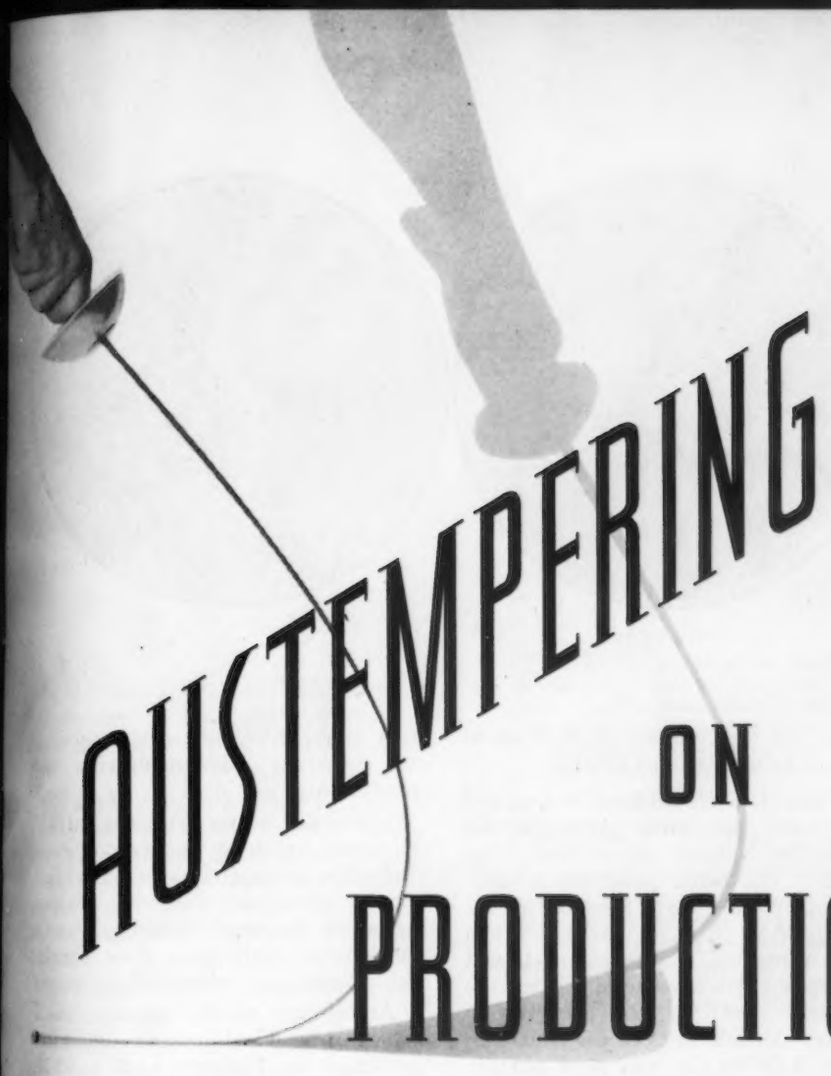


AUSTEMPERING ON PRODUCTION BASIS

By DON R. JAMES
Cleveland Editor, The Iron Age

° ° °

MANY a scientist trying to solve one problem has been amazed to run into a discovery far more significant than the intention of the original research. If metallurgists of the United States Steel Corp. had not noted the importance of definite time periods in heat treating years ago, while they were trying to solve breakage problems in regard to tempered wire, they might still be unaware of a method imparting improved ductility and hardness to steel.

It was back in 1928 when brittleness due to transverse cracks was the subject of intensive laboratory experiments which later led to the discovery of the theory now employed in austempering. Ten busy and troublesome years passed before the process first became available on a commercial basis. Today it is being applied to a wide variety of finished parts within certain hardness ranges at the Worcester, Mass., plant of the American Steel & Wire Co., where the first furnace started production in February, 1938.

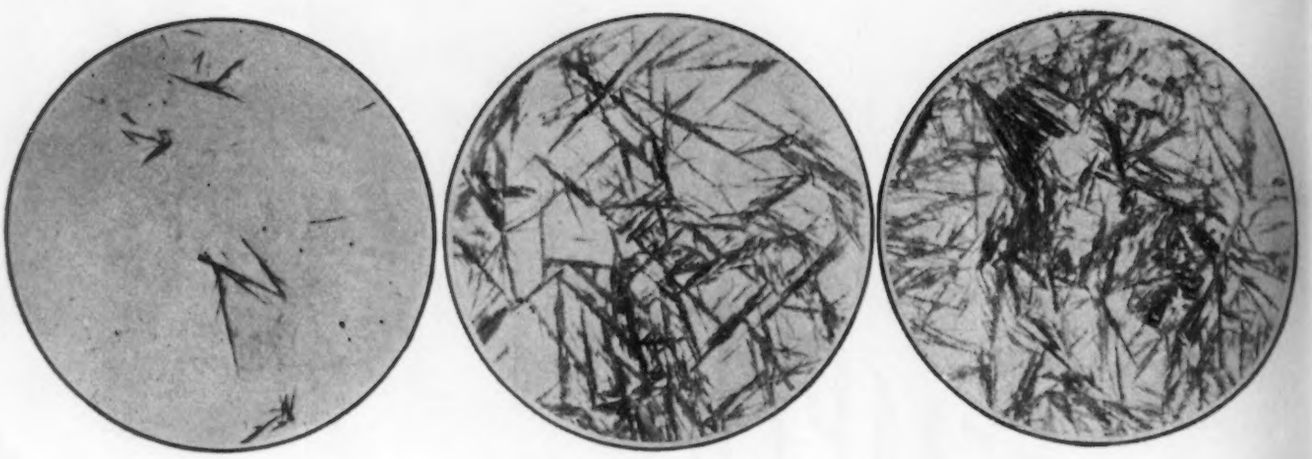
E. C. Bain, E. S. Davenport and E. E. Legge are the metallurgists whose names have been most prominently connected with this development. Bain and Davenport first published as a technical paper[1], in 1930, their findings establishing the theory of austempering. They were granted a patent in August, 1933[2]. Legge assumed the task of applying the process commercially at Worcester, a task accompanied by numerous problems before success was attained.

Austempering avoids the stage of hard martensite in heat treating. It is the process of heating steel above the critical point to gain an austenitic structure, then rapidly transferring the steel to a hot liquid quenching bath held at a selected, constant temperature below the critical range (usually from 350 deg. to 750 deg. F.) for a predetermined length of time until transformation to a non-martensitic structure has been completed. Then the steel is cooled to room temperature by any convenient means, usually water quenching. Hard martensite is avoided and the resultant microstructure is known as "bainite." Fig. 1 shows the transition to bainite.

By comparison, under the customary quench and temper process, the steel after being rendered austenitic by heating above the critical is quenched in water or oil, resulting in a hard martensitic structure, and is followed by reheating to obtain the desired properties before cooling to room temperature.

Microscopic examination of bainite shows a grain structure with a greater degree of accicularity than tempered

[1] E. S. Davenport and E. C. Bain. "Transformation of Austenite at Constant Subcritical Temperatures." *Transactions American Institute Mining Metallurgical Engineers*, Vol. 90, 1930, pp. 117 to 154.
[2] E. C. Bain and E. S. Davenport, United States Patent No. 1,924,099. Aug. 29, 1933.



martensite, and the needles are finer. An experienced metallurgist can discern the difference—for instance compare views in Fig. 1 with that in Fig. 2.

Table I is an interesting comparison of properties attained by the two heat treating methods, as applied to 0.180-in. diameter steel rods. At approximately the same hardness the austempered product shows all-round improvement, including notable ductility.

In commercial practice at Worcester, Mass., a salt quenching bath is employed. This salt bath is held at some constant temperature, ranging from 350 to 750 deg. F., depending upon the composition of the steel and the hardness sought. By using a fine-grain steel, temperatures of 1550 deg. to 1600 deg. F., which are considerably above the critical, may be employed to dissolve all carbides without danger of coarsening the structure.

The definite predetermined period at the constant sub-critical temperature is highly important. The transformation must complete itself without the intermediate stage to hard martensite. In seeking to apply the process commercially, invaluable S-shaped time and temperature curves have been developed painstakingly through extensive trials in order to facilitate the selection of the proper salt bath time and temperature.

Thorough knowledge of the steel's transformation characteristics at constant temperature is required. The "nose time," such as shown in Fig. 3 (a partial S-curve), must be well understood. For instance, whereas carbon steel C in the diagram, cooled at rate No. 4, passes the nose temperature without transforming and would proceed to a bainite structure, the three other rates for the same steel fail to clear the nose time, and the resultant product would not be bainite but fine pearlite.

Table II shows hardness ceilings and suggested maximum austemperable sizes for various carbon and alloy steels. The better properties of austempering are most pronounced between 48 to 58 R_c. Although carbon steel containing 0.55 per cent C can be treated, it is recommended that the carbon content be 0.60 per cent or above. Metallurgists of the American Steel & Wire Co. also point out the existence of a maximum austemperable size for each steel composition, since sections must be cooled with sufficient rapidity to prevent transformation to relatively soft pearlite during the quench to the austempering bath temperature.

There are scores of practical applications including safety toe caps, Belleville springs, firearm parts, link chains, automotive fastening devices, parts for business machinery, textile machinery, small tools, door checks, fishing rods, and electrical apparatus.

Automotive needle bearings show improved bend and impact results after austempering. Hardness of 57 to 60 R_c is regularly specified with a 10- to 15-deg. bend. Austempered open-hearth steel, with hardness in the required range, can be bent 90 to 120 deg. with-

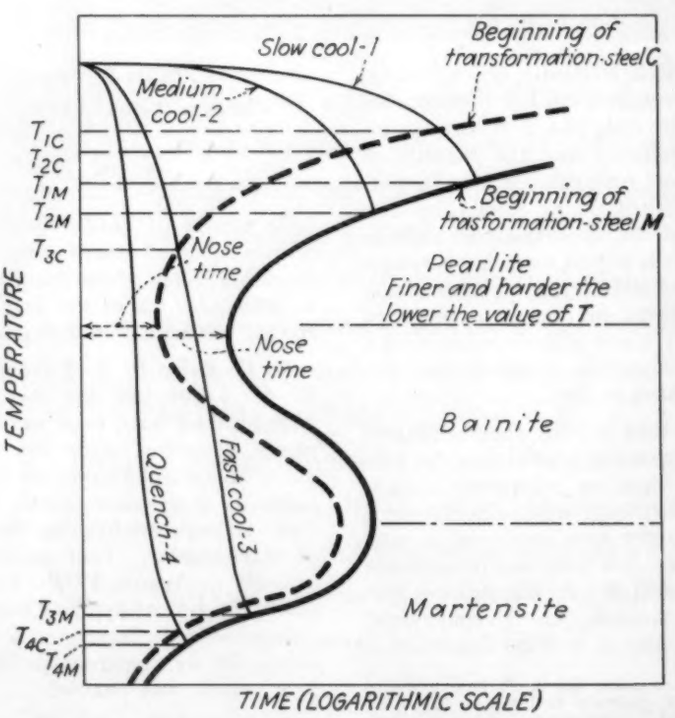


FIG. 3—The effects of composition and cooling rates on structures are shown in these partial S-curves for two different steels. Total transformation times are not shown.

AT LEFT

FIG. 1 — Transformation to bainite at 500 deg. F. of a steel containing 0.80 C, 0.64 Mn, and 0.166 per cent Si. Reading left to right: Trace of transformation, 25 per cent transformed, 50 per cent, 70 per cent and 100 per cent transformed. Photomicrographs courtesy J. R. Vilella, U. S. Steel Corp. research laboratory. Samples etched with 4 per cent picric acid; original magnification (4½ in. field) 1500 diameters.

o o o

AT RIGHT

FIG. 2—The tempered martensite, shown here at 1500 diameters, may be compared with the 100 per cent bainite shown in Fig. 1. For bainite, the grain structure is more accicular and the needles are finer.

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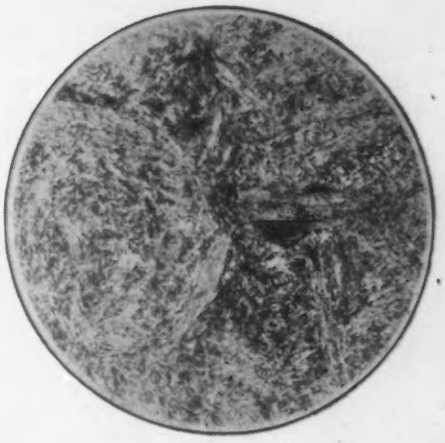
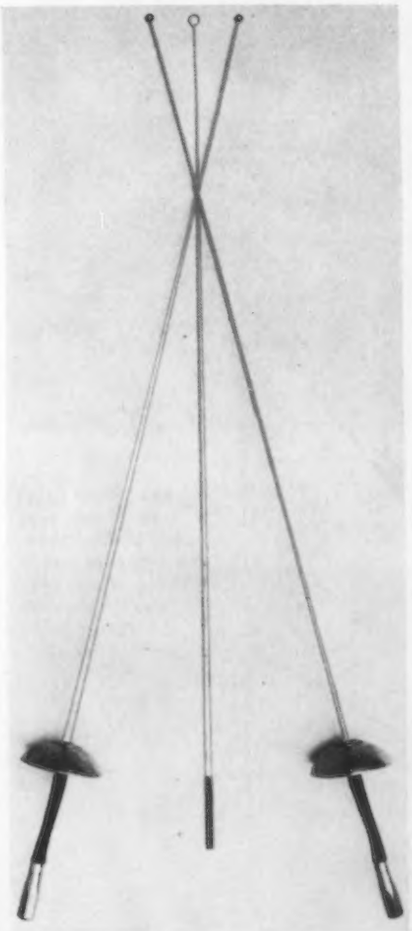


BELOW

FIG. 4—At hardness of 57 to 58 R_c, the fencing foil in the center of these three was bent to a small circle without fracture. The circle may be seen at the top of the middle foil.



out fracture, and will withstand around 25 per cent or more on the impact test than the quenched and tempered electric or Swedish steel.

Shovels and forks, normally made with hardness of around 45 to 48 R_c, are required to withstand considerable bend and wear resistance. Austempered shovels showing 52 to 55 R_c hardness will exhibit more toughness and greater flexibility. They naturally offer greater wear resistance at the increased hardness.

Lockwashers, which are essentially springs, need a high elastic limit and must not exhibit brittleness. They are tested by twisting to right angles. Under the ordinary quench and temper method, hardness is usually 49 to 52 R_c in SAE 1055 steel for sizes of stock equivalent to ¼-in. square. With austempering it is possible to go to 53 and 56 R_c and attain a much higher elastic limit, still retaining the toughness required.

Applied to small screw drivers, a straight carbon steel heat treated by the conventional quench and temper process to a hardness of 55 R_c will bend about 10 deg. before breaking. Austempering results on the same steel, in R_c hardnesses of 55 to 57, enable the screw drivers to bend 90 deg. and not fracture.

Manufacturers of shoe shanks, which are pieces of spring steel specially shaped and placed in the arch of the shoe to give it strength and help maintain its shape, are interested in uniformity, particularly from the distortion point of view. Austempered shoe shanks, it has been found, give greater uniformity, four to five points higher hardness, and the ability to still take set without breaking after the shoe shank has passed its elastic limit. It is also interesting to note that whereas manufacturers are accustomed to expect three or four points variation in hardness under the customary quench and temper method, variation in austempered parts has been reduced to one or two points.

Austempering is well adapted to pocket knives, and results in improved bend properties for pocket-knife blades, which are usually treated below hardness of 60 R_c (which is the "ceiling" of the method). The back spring, which is usually held at 49 R_c to prevent breakage, can be brought up to 53 or 54 R_c for greater elasticity without danger of brittleness.

A manufacturer of large pipe wrench chains uses in them carbon-molybdenum steel pins, which must be hardened to 40 R_c before upsetting. A chain incorporating pins heat treated conventionally was found to break at a total load of 22,000 lb. When the pins were austempered to 50 R_c, the same upsetting became possible without fracture, and the chain broke at 28,000 lb. total load.

A highly interesting application of austempering is the fencing foils shown on the first page of this article and in Fig. 4. At hardness of 57 to 58 R_c, the foil in the center of the three, Fig. 4, was bent to a small circle without

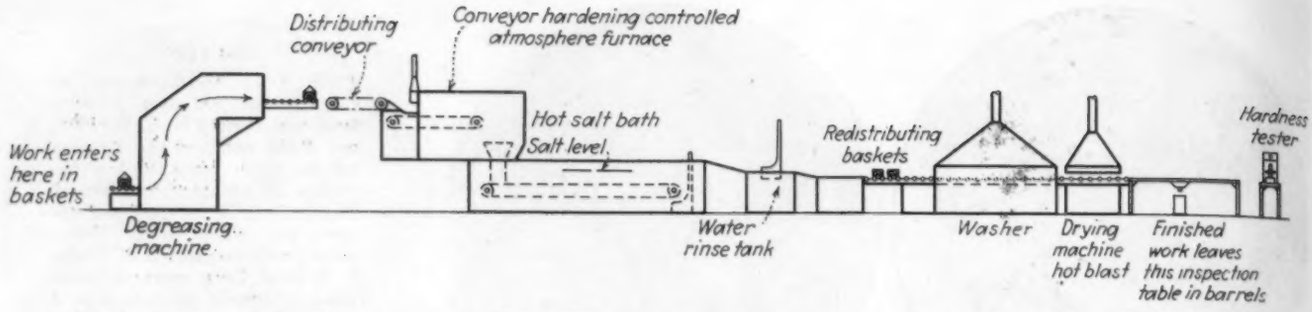


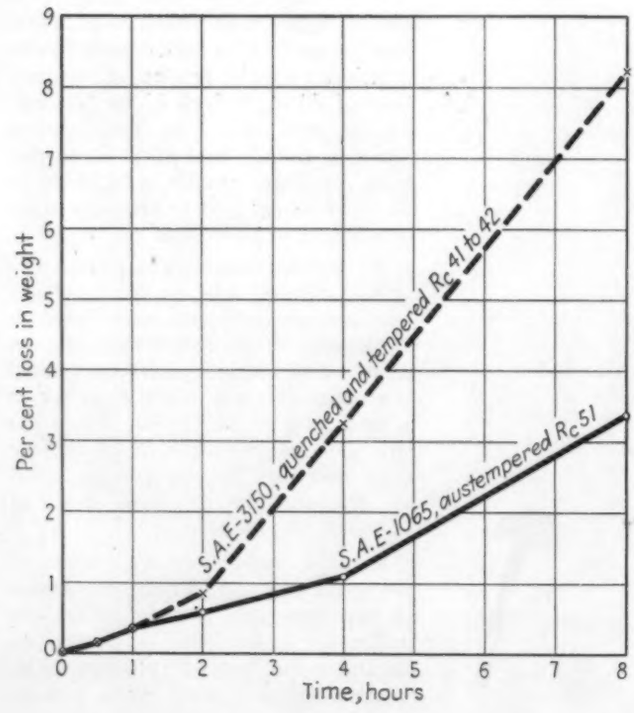
FIG. 5—The principal pieces of equipment employed in austempering on a production basis are shown in this flow diagram.

fracture. The circle may be seen at the top of the foil. The other photograph illustrates the capacity of the foil to flex and still come back to its original position. Fencing foils secured by austempering are sufficiently hard and elastic to withstand unusual flexing without taking set, although, as shown in the photos, the capacity to take set as illustrated by the smaller circle before fracture is still retained. Austempering thus offers increased safety for fencers, as present foils have been known to fracture at a much lower hardness, resulting in injuries.

Backlog of the Worcester furnace, which is located in the spring works at the South plant, is miscellaneous textile supply parts, such as bobbin rings and miscellaneous springs. The other products going through the furnace are, for the most part, austempered at a price per pound for outside manufacturers. The firms send in their unheat-treated parts, and the price per pound is established on the basis of the quantity and nature of the article. Outside companies having sufficient tonnage to install their own equipment, or to warrant conversion of their present equipment, will be licensed if they so desire.

Striving to apply the process commercially brought many problems. First to be determined was whether wire should be austempered continuously or whether finished parts should be done in batches. Since a very long furnace would be required for treating wire continuously, and due to temperature problems in such long furnaces, the best initial approach was batch operation. Furthermore, hardnesses over 50 R_c would be disastrous to coiling and forming tools used to fabricate the parts. With this decision made, other problems included engineering the bath to a high safety factor; heating the bath properly and securing quick temperature changes in order to supply different hardnesses for various batches.

Study of Fig. 5 gives an excellent idea of the general layout at Worcester. Principal equipment consists of a degreaser, 500-lb. per hr. hardening furnace, hot salt bath, water rinse, washer and hot blast dryer.



ABRASION tests on bicycle type roller chains, showing per cent loss in weight. Each plotted point represents a different chain (except ½ and 1 hr.)

TABLE I

Mechanical Property Tests of 0.180 in. Diameter Rods, conducted by United States Steel Corp. Research Laboratory. Except for the Bending Test, All Results Are the Average of Three Determinations.
Analysis of Steel: C 0.78; Mn 0.58; Si 0.146; P 0.042; S 0.040

Treatment: Quench and temper—Pb bath at 1450 deg. F. for 5 min., followed by oil quench; then tempered at 650 deg. F. for 30 min. Austempered—Pb bath at 1450 deg. F. for 5 min.; transformed in Pb-Bi bath at 600 deg. F. for 20 min.

Grain Size at 1450 deg. F.: 5-6, with 6 predominating.

Properties	Austempering	Quench and Temper
Rockwell C	50.1	49.8
Brinell	489	486
Tensile strength, lb. per sq. in.	259,300	259,000
Rupture stress, lb. per sq. in.	355,500	312,150
Elongation, per cent in 2 in.	5.0	3.75
Reduction area, per cent	46.4	26.1
Impact, ft.-lb.	36.6	14.0
Bending (free bend in ¾-in. length)	Greater than 150 deg. without rupture	Ruptured at 45 deg.

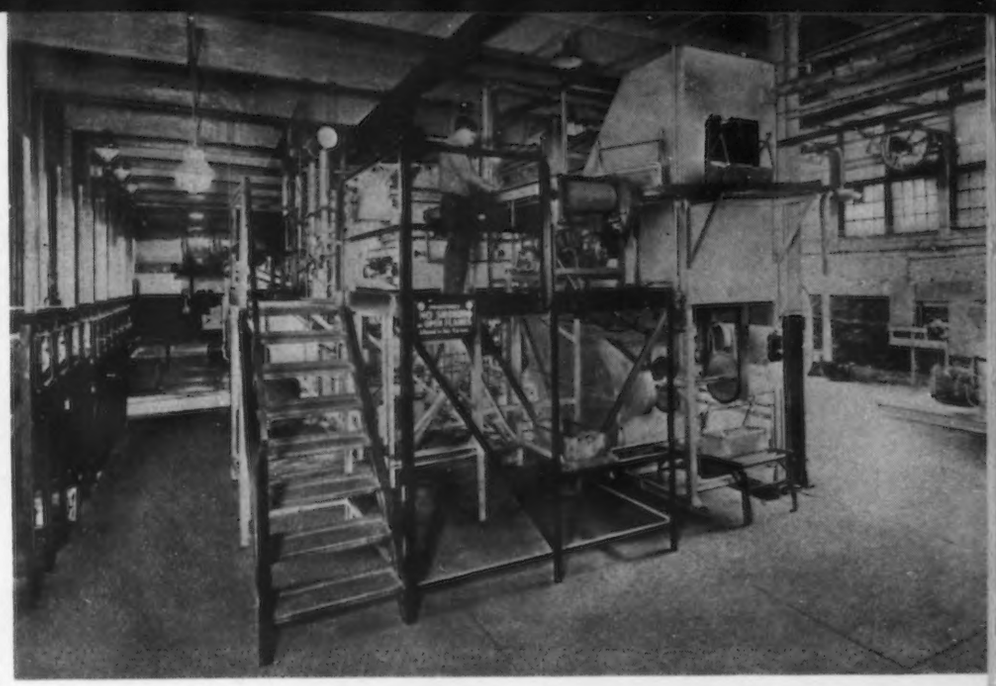
In the above, Rockwell C hardness is taken on a flat surface; ultimate tensile strength computed on orginal cross-section; rupture stress computed on reduced cross-section; reduction area at fracture; impact foot pounds with 90 ft.-lb. hammer upon unnotched round specimen.

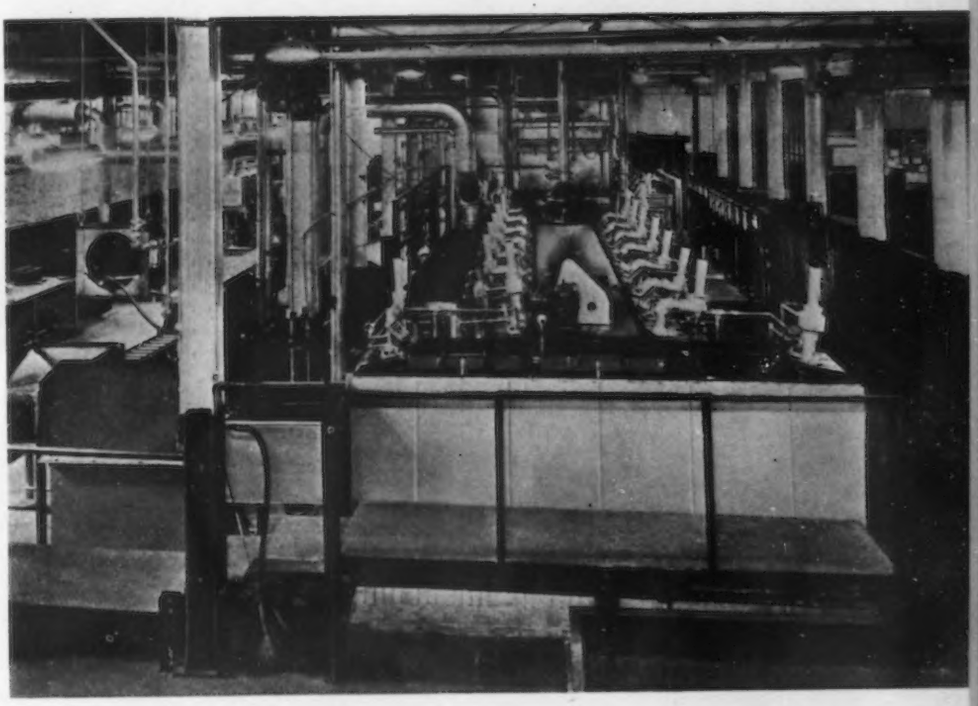
RIGHT

FIG. 6—(Right)—Loading end of Worcester furnace showing instrument control panel at left. Degreaser is at right with tote box beneath it. The work enters the furnace at the left of the operator on the platform. Fig. 7—(Center)—Continuous salt bath tempering furnace which receives the work from the hardening furnace, looking toward the exit end. Work drops off salt bath conveyor into the T-slot section in foreground without leaving the salt bath. Fig. 8—(Bottom)—Another view of production equipment. Degreaser, storage tank and trichlorethylene tank are shown at left. Hardening furnace and salt bath are across the rear. Washer, dryer and inspection table, right foreground.

o o o

The work is loaded on the floor level into baskets which are then automatically carried up on a sprocket chain and dipped into the liquid trichlorethylene compartment of the degreaser, followed by the vapor phase. The basket rises and is ejected on to a gravity conveyor where the work is distributed on a belt coveyor feeding the work into the gas-fired radiant tube hardening furnace, which has an effective heating length of 9 ft. There





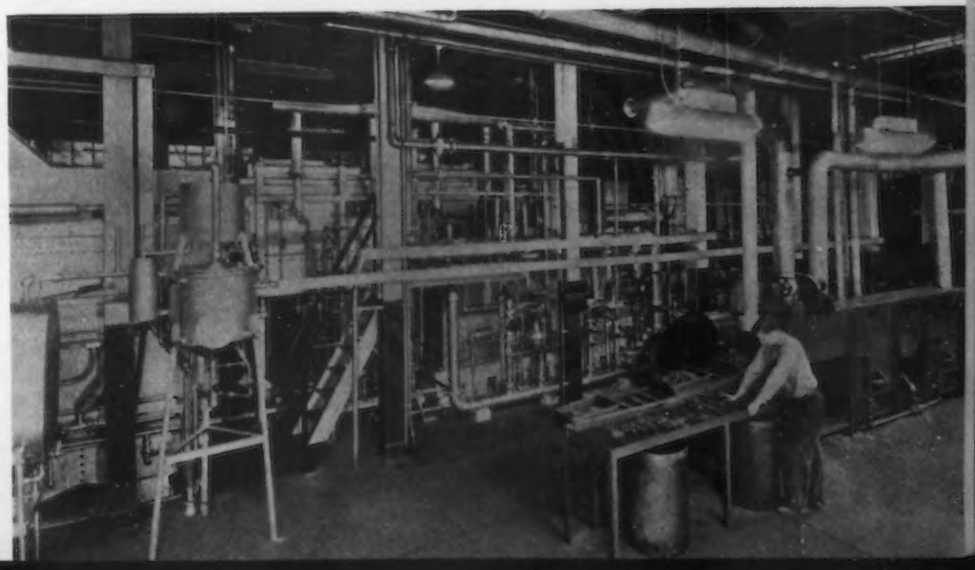
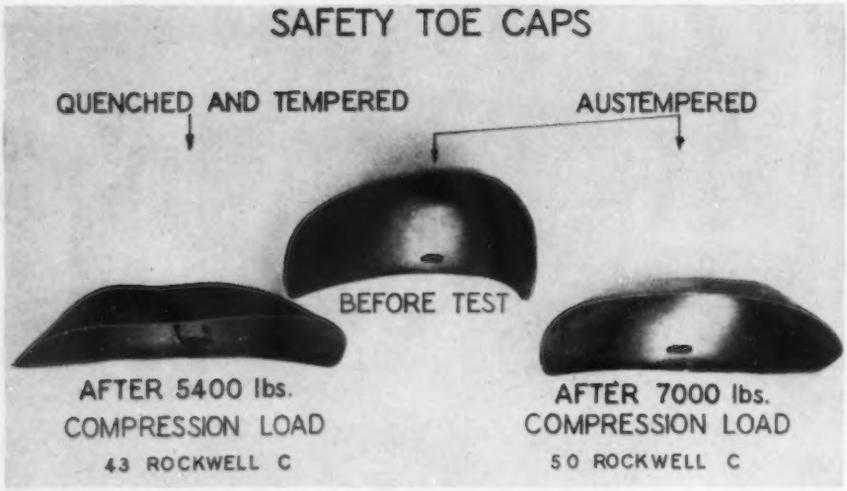
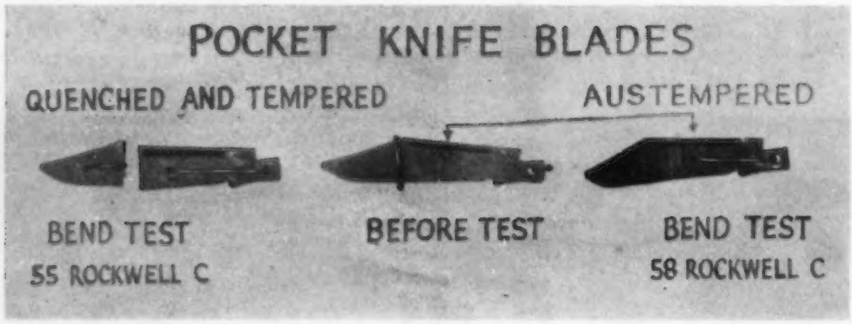


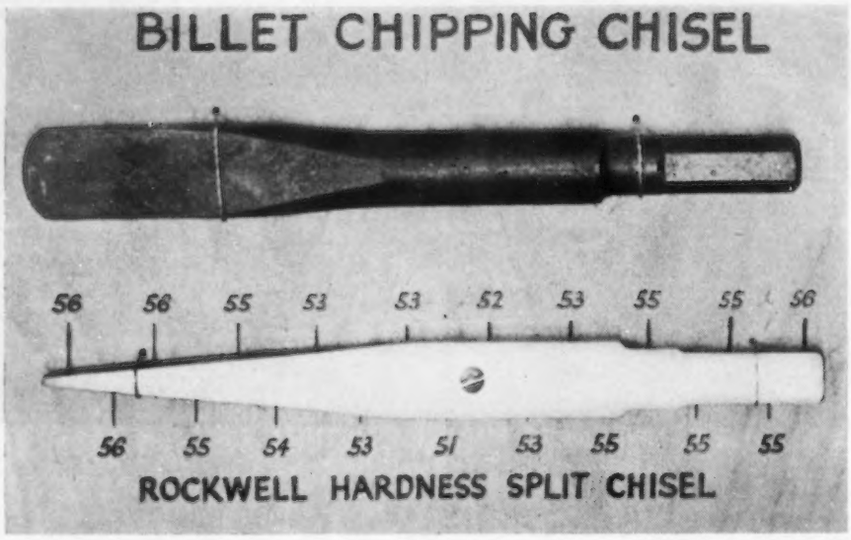
TABLE II

Showing a Few Carbon and Alloy Steels With Austempered Hardness Ceilings and Suggested Maximum Austemperable Sizes for Each Type of Steel.

Composition, Per Cent	Hardness Ceiling, Rockwell C	Maximum Diameter Round (or equivalent square), In.
C 0.95 to 1.05	57-60	0.148
Mn 0.30 to 0.50		
C 0.95 to 1.05	57-60	0.187
Mn 0.60 to 0.90		
C 0.60 to 0.70	53-56	0.187
Mn 0.60 to 0.90		
C 0.60 to 0.70	53-56	0.281
Mn 0.90 to 1.20		
C 0.60 to 0.70	53-56	0.625
Mn 1.60 to 2.00		
Alloy		
C 0.65 to 0.75	53-56	0.625
Mn 0.75 to 0.95		
Mo 0.25		
Alloy (SAE 4150)		
C 0.45 to 0.55	52	0.500
Mn 0.60 to 0.90		
Cr 0.80 to 1.10		
Mo 0.15 to 0.25		
Alloy (SAE 4365)		
C 0.60 to 0.70	54	1.0 or larger
Mn 0.50 to 0.80		
Cr 0.50 to 0.80		
Ni 1.50 to 2.00		
Mo 0.30 to 0.40		







There are innumerable objects now being austempered commercially. Above are three samples of this type of work. Note particularly the hardness uniformity of the chisel, and the hardness and high compressive strength of the safety toe cap.

are four temperature control zones. The work is fed automatically and is carried through and heated to an austenitic temperature of around 1575 deg. F. on an alloy belt. The time of this cycle may be varied from 5 to 25 min., depending upon the size and composition of the work to be heated. Fig. 6 is a view of the furnace, at loading end.

From the heating furnace, the work is dumped into the salt bath through a chute which extends into the bath, making a perfect seal, and on to the steel conveyor in the salt bath, which is held at the desired austempering temperature. The work is lightly distributed on the belt. At the end of the salt bath (but still within it), the parts drop off the conveyor into suitable baskets, and when the time required for complete transformation has elapsed, the baskets are mechanically lifted and dropped into a water quenching tank. The work is then washed, dried by hot blast, and followed by the inspection, hardness testing, and finally oiling, tumbling or ball blasting, as the specifications require.

The sand-sealed hardening furnace employs a prepared atmosphere from a 4000 cu. ft. per hr. unit. In general, work ranging from small pieces 3/32 in. diameter and ½ in. long, to large parts 16 in. diameter by 0.1 in. thick with a formation not higher than 2⅞ in. can be handled. The four temperature controlled zones (at entrance, center of the furnace, discharge end and salt bath chute) are all recorded.

Seventy thousand pounds of sodium nitrite and potassium nitrate in equal parts form the mixture in the continuous salt bath tempering furnace, which is 35 ft. long, 3½ ft. wide, and 2½ ft. deep. Fig. 7 shows the bath from the discharge end. There are 22 radiant tube burners, 11 on each side, and six temperature control zones. Fig. 8 shows another view of the entire installation.

Temperature and time of immersion being of utmost importance in the bath, close control is necessary over both. Conveyor time usually runs from 9 to 55 min. operated by variable speed control, but additional time in the bath can be permited if desired, because the work drops from the conveyor into the baskets without leaving the solution. Temperature control is assisted at the end nearest the hardening furnace by auxiliary cooling tubes.

The major portion of the salt is salvaged by pumping salty water back on top of the salt bath through a reclaiming cone. The salt bath unit is removable for repairs, if necessary.

Extensive safety precautions have been taken against possible hazards in operation of the furnace, which has been made as nearly automatic as possible. Alloy steel is used for the chute from the hardening furnace into the continuous salt bath. This is because at temperatures below 1300 deg. F. ordinary steel would tend to catalyze the breakdown of carbon monoxide to elemental carbon, which might result in ignition at the bath surface. A mine alarm has been rigged up to detect excess carbon monoxide from either the prepared atmosphere outlet or from possible faulty connections.

An analygraph records the constancy of the furnace atmosphere and indicates the need for adjustment, if necessary.

GEAR BLANKS CAST CENTRIFUGALLY

THE Ford Motor Co.'s experimental work in casting gear blanks in centrifugal dies, first announced just a year ago, is said to be wholly successful and centrifugally-cast gears now are in regular production.

R. H. McCarroll, Ford metallurgist under whose supervision the development was conducted, said production of all Ford truck ring gear blanks now was by the centrifugal method. It will be extended to full production of the car ring gear and the transmission cluster gear as quickly as the necessary equipment is completed.

Greater strength, lighter weight, and faster production are the principal advantages of the gears claimed for the new method, Mr. McCarroll said. By using sand cores in the die, undercuts can be made which would be impossible in a conventional forging, he pointed out, and this saves weight and metal.

Still more important, however, is the greater strength of these gears made by centrifugal casting. Etched sections show the reason. In some forgings lines of metal flow are parallel to lines of greatest stress. Because of absence of all flow lines in the centrifugal castings, this condition does not exist. The metal is equally strong in all directions.

The simplicity of the centrifugal method is especially noteworthy, as shown in the accompanying illustration. The dies, which are made of a special low-carbon steel, are mounted on a turntable designed and built by Ford engineers. There are 18 of them on the turntable. Each begins to spin as it approaches the pouring ladle, continues to whirl for the two minutes required for the metal to solidify, and then stops turning in time for the operator to remove the hot blank and prepare the die for the next casting.

An ingenious feature of the casting turntable is that centrifugal force is used to lock the dies in position. This is done by "dogs" which are pivoted in the middle. There is a weight on one end, and a hook on the other. When the die spins, the weight flies out and drives the hook onto a ledge on the top half of the die, securely locking it into place. When the die ceases to spin, the weight falls down, automatically releasing the die for the removal of the gear blank.

As now set up one man loads the cores into the dies and sets in position top half of die, another pours the molten steel, and a third removes the die top and gear blank. Approximately 4 min. is the time for one complete revolution of the turntable. The dies are spun at 190 r.p.m. in the case of the truck ring gear. For the smaller car ring gear blank, the speed is 325 r.p.m., and for the transmission cluster gear with its still smaller perimeter, the speed is 400 r.p.m.

BLAST FURNA

PERIPHERAL distribution of gas is of major importance in blast furnace operation. Herein are distribution data for Inland's new No. 5 furnace, which data confirm results obtained previously on three other Inland stacks.

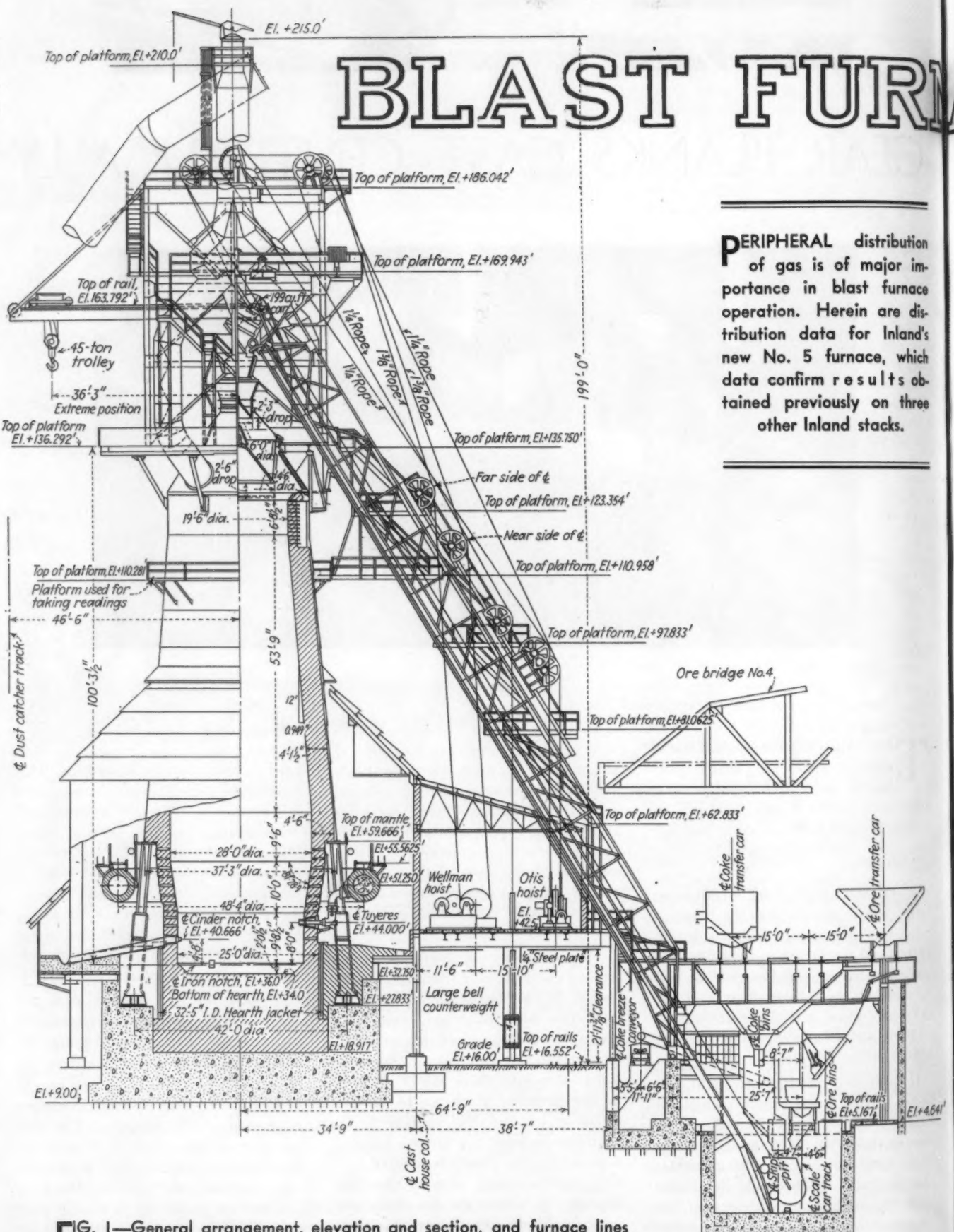


FIG. 1—General arrangement, elevation and section, and furnace lines of the new Inland Steel Co. No. 5 stack. The furnace has 14 tuyeres.

RACE GAS FLOW

By HJALMAR W. JOHNSON
Superintendent of Blast Furnaces, Inland Steel Co.

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THE investigations made by the Bureau of Mines established the importance of gas-solid contact in the blast furnace stock column. Kinney, Joseph, and others made studies of the distribution of gas along a radius of various planes and from these surveys concluded that there was room for improvement in the gas flow in the furnaces investigated. A result of their studies has been a better understanding of those factors in design and furnace operation which control the radial distribution of the gases resulting in higher furnace efficiencies.

Irregularities occur in blast furnace operation which are impossible to explain on the basis of radial distribution of the gas. It has been belived that sometimes the gas flow may not be the same along all radii in a plane, that there may be more gas flow up one side of the furnace than up the opposite side, and such irregularity results in irregular furnace operation.[1] Studies of the gas flow around the periphery of the in-wall on three blast furnaces at the Inland Steel Co. have been in progress for five years. These studies have proved that the peripheral distribution of gas is of major importance in furnace operation. The purpose of this discussion is to show that the same conclusion regarding the importance of uniformity of gas distribution at the periphery holds on a fourth furnace, the Inland Steel Co. Madeline No. 5 stack.

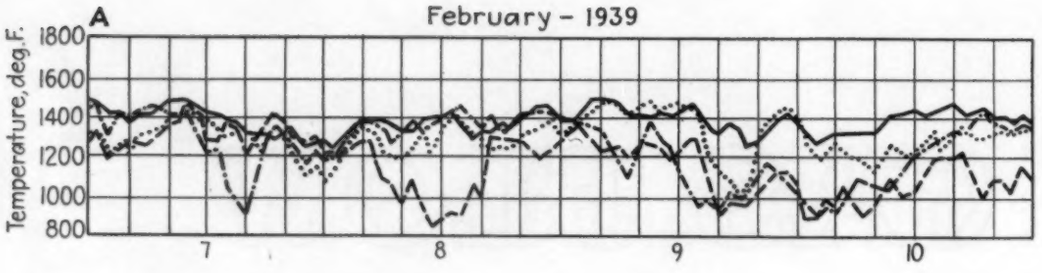
Inland Steel Co. Madeline No. 5 was designed and built by the Arthur G. McKee Co., which designed and built the first blast furnace at that plant over 30 years ago. It is a complete new furnace—25 ft. hearth, 101 ft. high and is rated at 1000 tons of iron per day. The principal dimensions and the general arrangement of the furnace are shown in Fig. 1. A detailed description of the installation has previously been published.[2] In Fig. 1 is shown the platform at elevation 110.281 ft. which is used in making studies of the gas distribution. The furnace was blown in on Jan. 3, 1939, and has been in continuous operation.

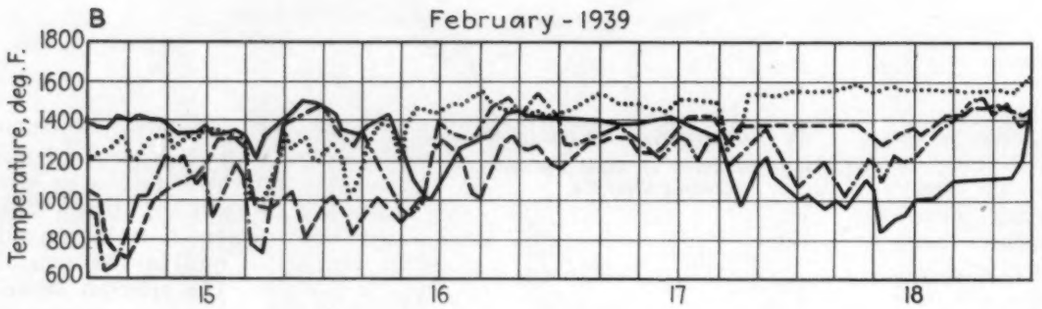
Certain conclusions have previously been stated regarding peripheral distribution of gases.[3] The temperature of the gas at four equidistant points in a plane about 10 ft. below the stock line is taken as a measure of the peripheral distribution of the gas. If the temperatures of the four points are the same, then the distribution of the gas over the periphery in four directions is the

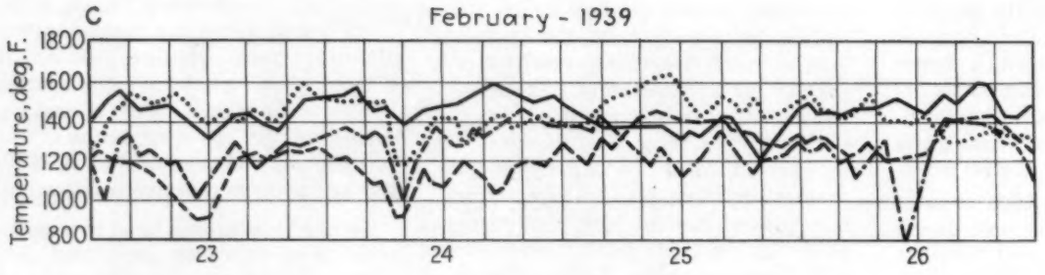
[1] "Temperature Reading in Blast Furnace Stock Column," by Hjalmar W. Johnson, Blast Furnace and Steel Plant, February, 1938.
[2] Blast Furnace and Steel Plant, March, 1938.
[3] "The Peripheral Distribution of Gases in the Blast Furnace," Hjalmar W. Johnson, American Iron and Steel Institute, 1938.

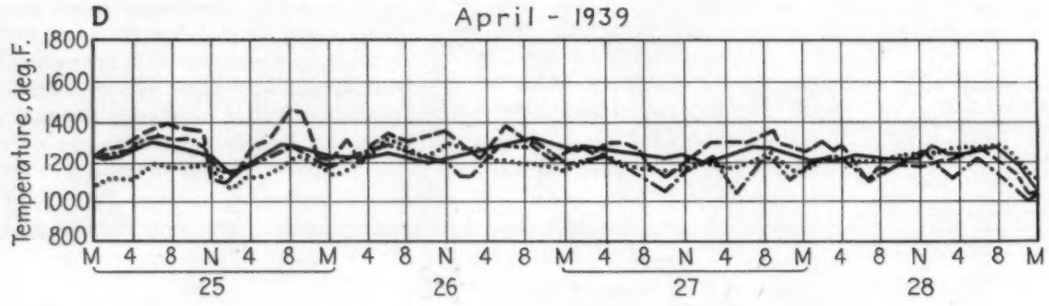
TABLE I
Operating Data for No. 5 Furnace

1939	Daily Production, Gross Tons	Pounds of Coke per Gross Ton of Pig Iron	Blast Temperature, Deg. F.	Cu. Ft. of Wind per Minute	Top Temperature Deg. F	Iron Analysis Si	Iron Analysis S	Slag Analysis SiO_2	Slag Analysis Al_2O_3	Time Lost	Pounds of Dry Flue Dust
Feb. 7	1009	1500	1230	54,000	285	1.07	0.027	38.26	11.74	....	62.2
8	986	1504	1150	54,000	285	1.15	0.026	38.44	12.09	....	56.8
9	929	1628	1245	54,000	300	0.98	0.027	38.60	11.54	....	60.4
10	974	1540	1120	54,500	300	1.22	0.026	38.94	10.95	....	34.5
Average	975	1543	1186	54,125	293	1.11	0.027	38.56	11.58	....	53.5
Feb. 15	1009	1557	1280	55,000	310	0.91	0.032	38.98	10.82	....	62.2
16	915	1713	1220	53,000	295	1.00	0.033	39.86	10.99	....	49.0
17	905	1692	1270	55,000	420	1.03	0.034	37.80	11.26	....	148.0
18	720	2095	1185	53,000	425	1.19	0.032	37.94	13.36	....	295.6
Average	887	1764	1239	54,000	363	1.03	0.033	38.65	11.61	....	138.7
Feb. 23	904	1676	1125	54,000	330	1.13	0.028	39.04	11.49	....	86.7
24	937	1640	1130	54,000	350	1.12	0.030	39.10	11.92	....	55.0
25	932	1623	1110	54,000	330	1.07	0.032	39.20	12.11	....	60.1
26	989	1532	1130	54,000	330	1.19	0.030	38.62	11.37	....	56.6
Average	941	1618	1124	54,000	335	1.13	0.030	38.99	11.72	....	64.6
Apr. 25	1013	1593	1110	58,000	345	1.04	0.025	37.36	14.28	....	11.0
26	969	1684	1060	58,000	355	1.15	0.025	37.02	14.75	....	18.5
27	1006	1654	1170	58,000	335	1.02	0.027	38.06	14.34	....	17.8
28	1150	1519	1330	58,000	320	0.80	0.030	38.14	14.17	....	39.0
Average	1035	1612	1168	58,000	339	1.00	0.027	37.65	14.39	....	21.6









AT LEFT

FIG. 2—Types of records made by inwall temperatures. Graphs in A show satisfactory furnace operation; those in B show a period of unsatisfactory operation.

AT RIGHT

FIG. 3 — Relationship between peripheral distribution of gases and furnace operation.

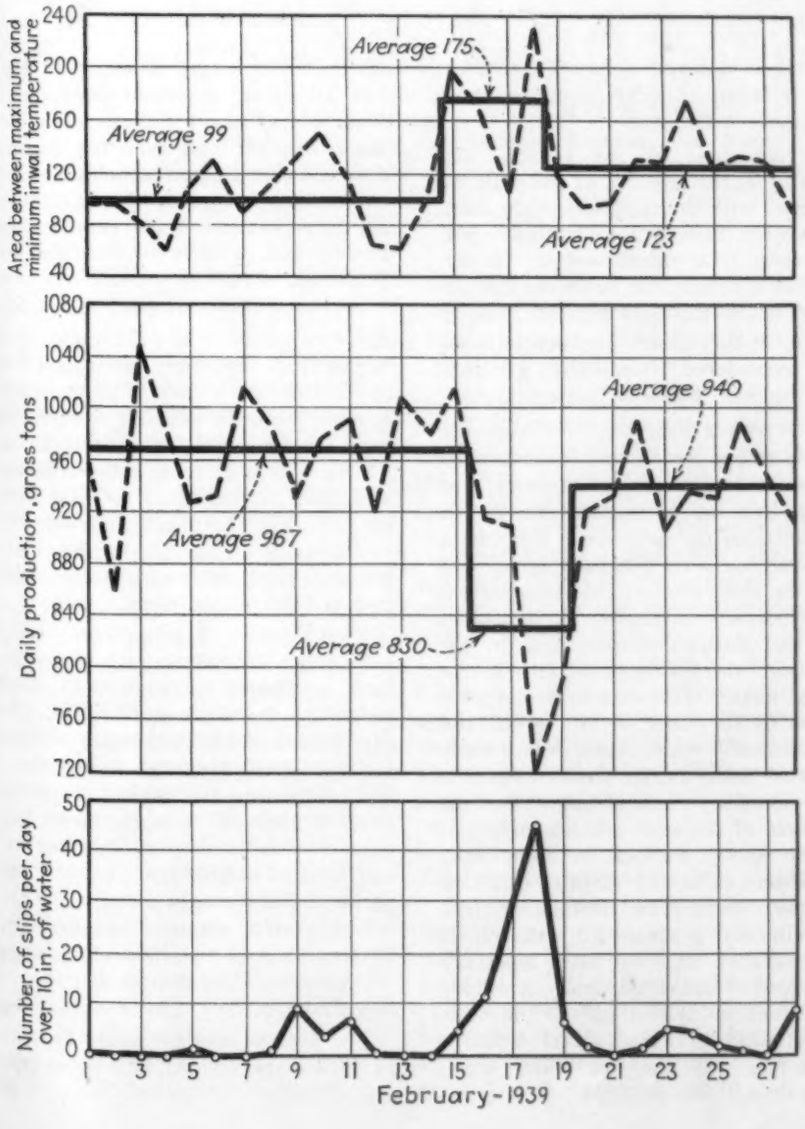
same. And if the gas flow at the periphery is different, as indicated by a difference in temperature of the four points as recorded on an inwall temperature chart, it reflects a condition within the furnace. When there is little irregularity the furnace moves smoothly, the dust production is satisfactory and iron is generally uniform in quality. Frequently there is much irregularity, an excess of gas flow on one side and a deficiency of flow up the opposite side. Such non-uniformity in the peripheral distribution of the gases always results in inferior furnace operation. Generally it results in much "blowing through," frequently in hanging and slipping. The movement of stock is irregular, iron varies in quality, coke consumption and flue dust production increase.

The inwall temperature record for four 4-day periods has been reproduced in Fig. 2 and furnace performance for these periods shown in Table I. The type of curve marked "A" is accompanied with satisfactory furnace operation. Even though no water was charged on any of the stock the top temperatures as measured in the dust catcher averaged 293 deg. F. That the furnace was operating efficiently is shown in the average daily tonnage of 975 with only 54,125 cu. ft. per min. of wind (average). The burden consisted of 12 per cent sinter, 88 per

cent Lake Superior ores. No scrap or scale was charged.

Curves B show a period of unsatisfactory operation, particularly on Feb. 17 and 18. The decided irregularity apparent on Feb. 15 was not particularly damaging, but the gradual upward movement on No. 1 point, starting at 8:00 a.m. on Feb. 16 was damaging. The temperature of this point remained high throughout the period, showing excessive gas flow up this side of the furnace. A large proportion of the gas was not traveling up through the stock, doing the required work of preheating and reducing, but was short circuiting from the bosh zone up this side and out. This resulted in loss of efficiency indicated by the higher top temperatures which averaged 420 deg. and 450 deg. F. for these two days. The excessive gas velocity through this zone resulted in much hanging and slipping and a production of only 720 tons on Feb. 18. The decided excess up one side on Feb. 17 and 18, as shown by the high temperature of No. 1 Thermocouple point, indicated improper peripheral gas distribution which always results in inferior furnace operation. This has also been observed on the Inland Steel Co. No. 2, 3 and 4 furnaces. Frequently it has been possible to correct such maldistribution by checking the furnace severely; at other times such treatment seems less effective.

The operation improved after Feb. 18 but was not as satisfactory as it was in the first period. The inwall temperature record for Feb. 23 to 26 is shown in curve C (Fig. 2), and a glance indicates the points are not so regular as in curve A. It is noticeable that while No. 1 point frequently goes up, it does not remain up as it did on Feb. 18. If it had remained up, and the excess gas flow past that zone had become established, the same inferior operation would have resulted.



The curves in D (Fig. 2) reproduce the type of inwall temperature record that is most satisfactory to observe. The furnace moves along smoothly, and the operator feels confident there is no building up within the furnace, and no gouging of the lining is taking place. The smooth operation is reflected in the average daily output of 1035 tons on 58,000 cu. ft. per min. of wind. This was typical of operation during the month when, on this same wind, the furnace averaged 1000 tons per day on less than 1700 lb. of coke per ton of iron. The iron was uniform in quality during the month, and no casts were produced that were over 0.035 per cent sulphur.

No changes were made in the operation of the furnace, of which the management was aware, which would have caused the poor inwall temperature record shown by the curves B in Fig. 2. The materials used were the same, the wind blown was constant and filling mark was constant. The method of filling was: Ore, ore, stone coke, coke, dump big bell. The coke was, as always, charged by volume, each skip weighing about 48,000 lb., making a total unit of 9600 lb.

One of the methods used to place a numerical value on the peripheral gas distribution was to measure, with a planimeter, the area between the maximum and minimum temperatures for each 24-hr. period. If the peripheral distribution is good the area is small; if distribution is bad, the area generally is high. The daily production and the area of the inwall temperature curves are shown in Fig. 3. Because there is a delay of about one day in the effect of gas flow on furnace tonnage, the averages for the production are one day later than the average for area. There is a decided increase in area from Feb. 15 to 18. This increase in area measured an uneven peripheral distribution of gas and this in turn resulted in irregular movement of stock. In Fig. 3 are also plotted the number of slips of the furnace in which the gas pressure exceeded 10 in. H_2O as measured in the dust catcher. The irregular stock movement resulted in a decrease in output from 967 to 830 tons for the four days, Feb. 15 to 19. When the gas flow was again uniform around the periphery, it was uniform in every individual annular ring in the plane, that is, the gases were more uniformly distributed over the entire area. Consequently, the average gas velocity was at its lowest, the movement of the stock again became regular, and furnace operation was satisfactory.

NICKEL PLATE

FROM its inception, electroplating has been looked upon as primarily a decorative process. Later in its history, electrotyping appeared as an outstanding exception to this rule. And, more recently with the advent of chromium plating, came the plate known as "industrial" or "hard chrome," which has since made an important engineering place for itself, for coating tools, gages, dies, textile printing rollers, etc., mainly for resistance to wear but also in some cases for resistance to corrosive chemicals.

Similarly, nickel plate has generally been considered a decorative coat, the primary function being an improvement in appearance. As a coating for ferrous metals it has also served to prevent rust, but in this connection it suffered from the general opinion that electrodeposits are porous. It must be admitted that this opinion was, on the whole, justified, partly because of imperfect plating practice, but mainly because the coatings put on were so light and thin, generally, that porosity was inevitable.

Within recent years, however, a new aspect of nickel plating has made itself apparent to the more progressive and better informed elements in the electroplating industry. The understanding is spreading among the users of plating, the manufacturers of electroplated products, that a deposit of nickel can be a highly protective coating, an effective wear and corrosion resistor, provided it is correctly applied.

The first realization of this fact came from the discovery that chromium plate in the thicknesses used for decorative purposes was altogether inadequate as a rust preventive. A deposit of 0.00002 in. is ample to provide a brilliant, and (to the eye) continuous, non-tarnishing coat with the bluish tinge which has become so popular with the public. Under the microscope, however, it was apparent that such a thin coat does not fully cover the base metal but leaves innumerable apertures through which attack may occur. Examination and test showed that even heavier chromium deposits contain minute cracks or discontinuities through which corrosion could take place.

Consequently, it became imperative to use some metal as an undercoat whose primary function would be that of a protector, leaving to chromium, the function of decoration. And, on a number of counts, the most eligible metal for this purpose was nickel. The conventional chromium plate, therefore, consists of an undercoat of nickel covered with chromium. By this practice, the plate is made really protective as well as decorative. A variation commonly used on ferrous metal is a layer of copper followed by a layer of nickel, surfaced by a coat of chromium.

From most of the reliable data available, the porosity of the plate decreases with the thickness of the metal deposited. Strictly speaking, of course, porosity is a variable term; for example, hydrogen can be forced through steel under sufficient pressure. However, in this discussion, porosity will be considered from the generally understood "practical" aspect.

Interesting data have recently been made public which throw much more light on the subject of porosity, and may lead to important changes in manufacturing practice. For some time it has been generally recognized among electroplaters that to some extent porosity is caused by impurities in the plating solution and in the deposit; also by imperfections in the basis metal. This has been corroborated by the work of Hothersall and Hammond[1], who found that finely divided solid matter in suspension in the solution, foreign matter on the surface of the steel and a rough condition of the surface were the most important causes of porosity in nickel deposits formed on unpolished steel. By eliminating suspended matter from the solution and by using specially prepared electrolytic iron or finely machined mild steel rod as the basis metal, they produced nickel deposits, pore-free (by the hot water test), less than 0.0001 in. thick.

To be sure these results have as yet been obtained only in the laboratory, under the most delicately controlled conditions. They may, however, represent only the first step which eventually will be followed by commercial practice. At the present time, one American firm, after long experience in atmospheric protective plating, has announced a specially treated deposit said to be substantially free from pores. Perhaps at a not too distant time, such deposits will be produced in the light thicknesses required for decorative coatings.

The proof and general acceptance of these seemingly elementary facts has led to an important development —the use of heavy deposits of nickel, much heavier than even the thickest decorative coatings, for industrial and engineering purposes, partly because of their freedom from porosity but also because of their excellent physical properties.

Although metal theoretically can be electrodeposited to any thickness, from a practical operating standpoint the application of a heavy plate brings with it problems peculiar to itself as well as the problems general to all plating. In addition to being adherent and free from nodules, it must have the strength, hardness and ductility required for the specific service under which it is to operate, on a par with cast and fabricated metal.

That these problems are being solved in a manner suitable for practical application to industry has been shown by the work of Wesley[2], who deposited nickel in thicknesses of 0.002 in. and over, pore-free by ordinary tests, with some mechanical properties equal to those of wrought nickel and some physical properties, like electrical and thermal conductivity, actually superior to the wrought metal. The excellent results obtained impelled Dr. Wesley to give the interesting name "cold castings" to heavy deposits of this character.

The present uses for heavy deposits of nickel are divided into three general classes:

[1] A. W. Hothersall and R. A. F. Hammond, "The Causes of Porosity in Electrodeposited Coatings, Especially of Nickel on Steel"; Transactions Electrochemical Society, Vol. 73, 1938, pp. 449-479.

[2] W. A. Wesley, "Physical Properties and Uses of Heavy Nickel Deposits"; Monthly Review of the American Electro-Platers' Society, August, 1938, pp. 581-603.

(1) Electroforming—the direct production of finished articles by electrodeposition, in which the deposit is built up and stripped from the cathode for separate and independent use.

(2) "Building-up"—increasing the dimensions of a part for repair or salvage, the part having been worn down in service or mis-machined.

(3) Corrosion protection — heavy coating of part or the whole of an object to prevent corrosion and heat oxidation, with or without wear and fatigue.

In electroforming, generally the most important consideration is the faithful reproduction of the design and dimensions of the part coated. In addition, however, the deposit must have sufficient strength to hang together unaided. It may later be backed up by another metal as in the case of electrotypes, but it must have at least a fair amount of inherent strength. Proof of the availability of these properties exists in electrotypes, phonograph record matrices and medals. The fine details are perfectly reproduced and they stand the severe subsequent treatment inherent in their use.

More recently, electroforming has widened its scope to include copper sheets in thin gages which are now available commercially in widths up to 60 in., in very long lengths and in weights from 1 to 7 oz. per sq. ft. (0.003 to 0.0094 in. thick). Kitchen utensils are being made in bi-metal, for example—a saucepan drawn from electroformed sheet 0.031 in. thick, of nickel on one side and copper on the other, nickel going on the inside of the finished part to be in contact with the food.

The latest development, wire screen made directly by electrodeposition, is an important contribution to present day manufacturing practice. Such screens are obtainable in any size or design capable of photographic reproduction. Thicknesses can be varied to suit industrial or decorative requirements. The advantages include accuracy in the sizes of the openings, wider range of choice and control in the relative sizes of the metal and the apertures, the elimination of crevices between overlapping wires, the elimination of the knuckles formed by the overlapping wires, and finer gages and lighter weights.

In the food products industries, the absence of crevices eliminates the danger of catching and holding particles of the material to be screened, thereby minimizing corrosion and the breeding of bacteria. In photoengraving the smooth electrodeposited screen makes for better light concentration, preventing the dispersion and blurring of light that take place through overlapping woven wires.

Electrodeposited screens are well suited for radios and earphones. A useful variation of this product is the perforated metal strip with the perforations appearing directly in the electrodeposited metal, thus eliminating the stamping operation. Radio and clock dials with the numerals appearing as very fine perforations are now being made by this process.

One of the dangers ever present in machine building is mis-machining, the accidental cutting down of parts to undersize. Often it is possible to reclaim such parts by building them back to oversize dimensions with electrodeposited nickel, and then machining them down to finished dimensions. This practice may represent a considerable saving over scrapping the part. Instances of savings by this form of reclamation are numerous in expensive parts for high speed and precision equipment where building-up and remachining will save a piece from the scrap pile which has already had a great deal of work put into it.

Similarly, parts worn down in service which are expensive to replace may be salvaged at a fraction of their cost. Heavy deposits of chromium are in widespread use on surfaces subject to hard wear but in many cases it has been found preferable to build up rapidly a heavy supporting layer of nickel and then to cover this layer with a thinner coat of chromium.

The list which follows shows some of the parts which have been salvaged in actual practice with heavy built-up nickel deposits:

Armature shafts; compressor rods; pump shafts, sleeves, rods and plungers; textile spindles; hydraulic rams; valve stems; wrist pins; lathe beds and saddles; splined shafts; lithograph rolls and paper mill rolls; electric motor end frames (mis - machined); cams for viscose manufacturing machinery; diesel crankshaft pin bearings; expansion sleeves (superheated steam); piston rod bearings; textile printing rolls; and turbine gear shafts.

On equipment for the power industry, heavy nickel deposits used in this fashion have been of more than ordinary service. The temperature coefficient of nickel is very nearly that of steel, making nickel coatings highly suitable for service at moderately high temperatures, such as in superheated steam, for example. Worn armature shafts can be built up without removing the windings. Salvaging worn refrigeration compressor rods makes possible the stocking of only one size of gland packing instead of carrying several smaller sizes to fit the turned down rods. In pump parts for corrosive liquids, the built up nickel surface gives not only longer wear but also better resistance to corrosion, as it does on paper rolls and on printing rolls.

The high physical properties exhibited by electrodeposits of nickel add appreciably to the length of life of the part, not only in heavy build-up applications but also with less extreme thicknesses, even where corrosion may be accompanied by some abrasion and erosion. With its good strength and resistance to oxidation, nickel coatings can be used on steel at quite high temperatures. Assuming proper adherence to begin with, the bond is improved by heating. A noteworthy example of corrosion and corrosion fatigue resistance is found in steel

Why and How!

o o o

By ADOLPH BREGMAN
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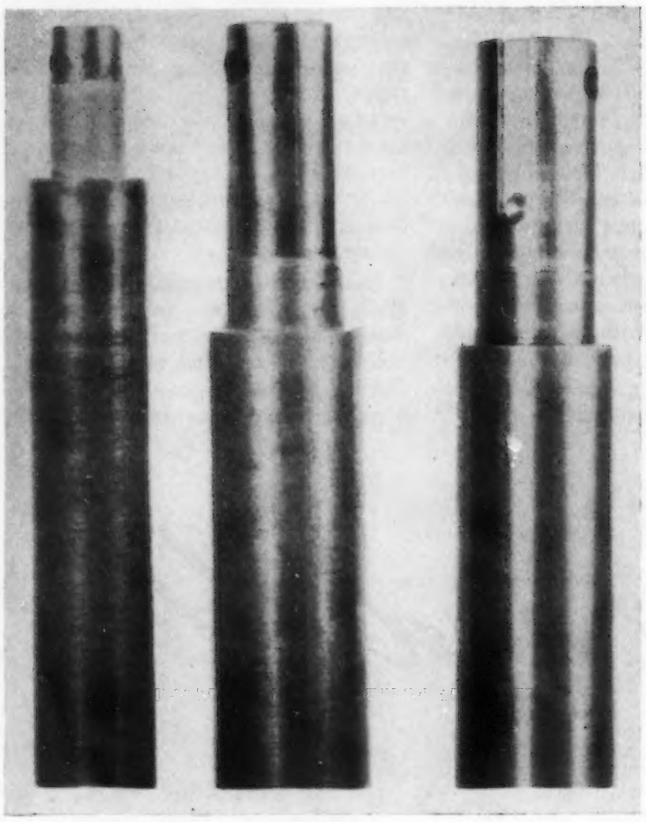
rods, hard plated to 0.006 in. which, under practical operating conditions, have exhibited high resistance to abrasion and also to corrosion by brines. These deposits are practically pore-free. In equipment for handling and containing chemicals, nickel plate from 0.001 to 0.003 in. thick has been found highly satisfactory, even under constant exposure to the chemicals. In another instance, the alkaline storage battery, nickel plate is used for resistance to the electrolyte, a caustic soda solution, in even much lighter thicknesses—0.0008 to 0.001 in. on the outside, and 0.0002 to 0.0003 in. on the inside, with satisfactory performance. Still another case is the nickel plate 0.002 in. thick on the anodes in the alkaline gas cells for making hydrogen and oxygen. In such cases, of course, freedom from porosity is vital.

As a general rule, industrial nickel deposits may be used for corrosion, abrasion and wear resistance, on equipment for contact with those chemicals which nickel will withstand, wherever the cost of solid or clad nickel would not be justified. These conditions exist in a surprisingly large number of instances in plants working with such widely diversified products as glass, soap, rayon, gasolene, food products, like fruits and vegetables, dairies and meat packing plants, chemicals like alkalies, neutral and alkaline salts, chlorides, carbonates, sulphates, nitrates and acetates.

Some of the uses, both actual and proposed, for nickel plate, are highly specialized, but nevertheless (or perhaps for that very reason) interesting. The resistance of nickel plate to hot atmospheres (in which it is a close second to nickel-chrome alloys) has brought it into use, 0.0001 in. thick, on steel to prevent scaling during annealing and cold drawing operations. The plate itself is much modified by alloying during these operations, but the surface of the steel is maintained in much better condition. Where it is later finished in baked-on enamel, the elimination of the need for removing the rough surface before enameling effects an important saving.



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AMSLER wear testing machine shafts. Left—shaft after plating to 0.005 in. with nickel; center — after machining the deposited nickel; right —after cutting for a key. The hardness of the plate is 400 Vickers.

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Another interesting use under consideration is for coating hopper doors on railroad freight cars. Here details are lacking but if the plan is successful, it will be a large feather in the cap of nickel plate.

Substantial deposits of nickel are used to advantage on machine parts, to an increasing extent to brighten up the machine, to make it more attractive to the prospective buyer and also to induce the user to take better care of it by keeping it cleaner. An interesting, though old, application of this type is the plate on bicycle sprockets. Of course, the primary reason is decoration and freedom from rust. However, the plate also has to stand severe abrasion where the sprocket is engaged by the chain; and although it is worn off more rapidly there than elsewhere, still, the appearance *(when a good plating job has been done)* is not unsightly; the plate does not chip, flake or peel off.

This type of application might well be considered by machinery manufacturers for moving parts of their equipment.

The hardness of nickel deposits varies with the composition of the plating bath and the conditions of operation. Wesley found the hardness of soft nickel deposits plated from the conventional Watts bath to be 130 to 150 Vickers, and the hard nickel plated from a special bath, 350 to 450 Vickers. (For comparison, copper from an acid bath runs from 40 to 60 and chromium 500 to 900.) Table I, given by Wesley, shows the mechanical properties of nickel electroplate compared with other forms of nickel.

It is noteworthy that the properties

TABLE I
Mechanical Properties of Nickel

Form	Hardness V = Vickers B = Brinell	Tensile Strength Lb. Per Sq. In.	Elongation, Per Cent in 2 in.
Cold-rolled, annealed	100 to 130 (B)	65,000 to 75,000	45 to 50
Cold-rolled, hard	180 to 230 (B)	90,000 to 105,000	15 to 30
Castings	80 to 125 (B)	55,000 to 70,000	15 to 30
Soft electroplate	150 (V)	51,000	28
Medium electroplate	230 (V)	98,000	21
Hard electroplate	360 (V)	132,000	1

TABLE II
Density of Nickel

Form	Density at 23 deg. C. (73.4 deg. F.)
Cold rolled sheet	8.86
Soft electroplate	8.86
Moderately hard electroplate	8.91
Hard electroplate	8.89

TABLE III

Effect of Annealing on Hardness of Hard Nickel Deposits

Initial Hardness	Time, in Hours	Temperature, Deg. F.	Final Hardness
325	18	400	295
325	one week	400	295
325	18	500	295
470	24	500	400 to 450
475	4	600	222
445	4	600	380

TABLE IV

Soft Nickel Plating Solution

Solution:
Nickel sulfate (crystals) = 44 oz. per gal.
Nickel chloride (crystals) = 4 oz. per gal.
Boric acid = 4 oz. per gal.
Temperature = 140 deg. F.
pH = 2.0 (electrometric)
Current Density:
25 to 50 amp. per sq. ft. (no agitation)
100 amp. per sq. ft. (with agitation)
Hardness = 140 to 160 Vickers (10 kg. load)
Rate = 0.0024 in. per hr. at 50 amp. per sq. ft.

TABLE V

Hard Nickel Plating

Solution:
Nickel sulfate (crystals) = 16 oz. per gal.
Ammonium sulfate = 2.8 oz. per gal.
Potassium chloride = 1.1 oz. per gal.
Temperature = 120 to 130 deg. F.
pH = 5.2 to 5.8 (electrometric)

	Current density, amp. per sq. ft.	Hardness, Vickers
Without agitation	20	350 to 400
	35	400 to 450
With agitation	25	350 to 400
	50	400 to 450

of nickel plate deposited from a special bath compare excellently with cast and rolled nickel, and that the densities of the nickel in these forms are so close together, as shown in Table II.

Clearly, electrodeposited or "cold cast" nickel is as sound as cold rolled or "hot cast" metal.

COCK and plug used in finishing rayon. The plug is nickel plated to 0.020 in., then machined and lapped to give a satisfactory fit. Photo from International Nickel Co.

The hard nickel deposits can be softened at a lower temperature than wrought nickel, because of the high purity of the metal deposited, its very fine grain and the high internal stress in the deposit. Table III shows, however, that electrodeposited nickel for this type will retain its high hardness up to 500 deg. F.

Photomicrogaphs show clearly that hard nickel deposits have a much finer grain size than soft nickel deposits, or cast or rolled nickel. They are not fibrous like the soft nickel deposits. At about 350 Vickers the grain size is sub-microscopic, and above 450 Vickers the deposit in the standard bath may develop some lamination and even cracking in the heavier deposits.

There is no general agreement on the theory of hardness in electrodeposits. For a long time it has been attributed to the presence of hydrogen, due to the fact that certain metals (like iron, cobalt, nickel, chromium and palladium) with high capacity for dissolving atomic hydrogen at room temperatures also exhibit the widest differences in hardness between the electrodeposited and the wrought forms. Also, some of these metals soften at lower temperatures in the hard deposited form than in the wrought form. However, much evidence points to other reasons for hardness. Hydrogen can be driven off from these deposits at low temperatures in a vacuum, with little loss of hardness. In nickel deposits hardness does not follow hydrogen content closely, while it does increase steadily with reduction in grain size. Under high temperature anneals, microscopic non-metallic inclusions appear, which are greater in number in harder deposits. It is now suspected that the hardness may be due to the fine grain size and also perhaps to non-metallic particles in a critical state of dispersion in the deposit, which interfere with slip, causing the metal to act like precipitation-hardened alloys.

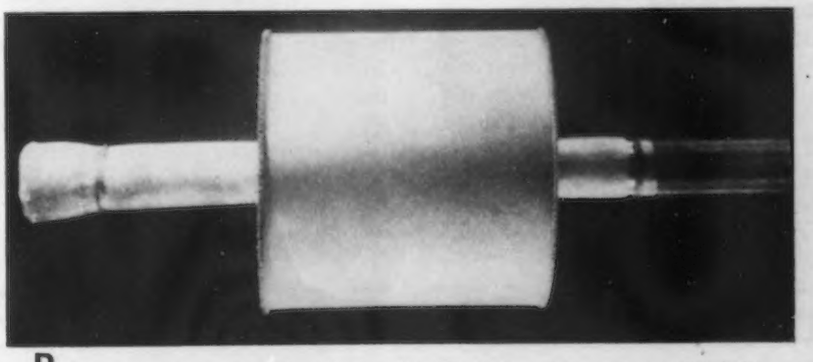
The bath used by Dr. Wesley for soft nickel plating (Watts type) is shown in Table IV.

The bath recommended by Dr. Wesley for plating hard industrial deposits is shown in Table V.

In very recent work, as yet unpublished, sound nickel deposits of about 400 Vickers hardness have been repeatedly produced as thick as ⅛ in. This has been accomplished by modification of the composition of the electroplating bath in such a direction as to reduce the stresses present in the growing deposits.

Regardless of the uses for which they are intended, all electrodeposits of nickel must adhere firmly to the basis metal and must be continuous, covering it completely. The properties which may vary in degree with the type of service for which the plate is intended are thickness of deposit, hardness and ductility. Decorative deposits may be soft, in many cases are preferably so. Heavy thicknesses (over 0.002 in.) are rarely if ever required, even for the most severe outdoor service. Industrial deposits, on the other hand, must be very heavy, sometimes up to 0.2 in., and they must have high strength and hardness.

In heavy plating for industrial purposes, the factor of porosity of deposits is less troublesome, being minimized by the heavy coat of metal deposited. Nevertheless, improvement in plating practice which produces a deposit of higher purity, with accurate control of thickness and structure to give the desired physical properties, will produce a coating better able to resist the wear and corrosion incident to industrial use.



PAPER roll plated with 0.025 in. of nickel. Photo from International Nickel Co.

INCLUSIONS — IN RIMMING STEEL

By J. G. DUN and J. F. BEKOLA
Metallurgical Department, Republic Steel Corp., Warren, Ohio

INCLUSIONS contained in rimming steel have a direct influence on performance during deep-drawing. Therefore, any study relating inclusions to performance is of great value. Last week the authors discussed sulphides and silicates, presented a great deal of data on the relationship of sulphide banding and inclusions, occurrence of silicate inclusions, etc. In this, the second section of a two-part article, a study is made of the source of inclusions and the mechanisms of inclusion formation.

IN tracing the origin of silicate inclusions, a systematic study was conducted on furnace tests, ladle tests, and tests from ingots. The furnace tests were obtained by pouring steel into 1x1x3 in. iron molds prior to tapping. Thus, any inclusions in the metal would be entrapped because of the rapid cooling. Similar tests were taken from the ladle at the fifth, fifteenth, and twenty-fifth ingots poured. In no case was any deoxidizer such as aluminum added to these tests.

Sections for micro-examination were taken ½ in. from the bottom of the casts. All the furnace tests were exceedingly clean. The inclusions that were present were mostly small particles of iron oxide and some larger particles of iron-manganese oxide, almost all of which were spherical in appearance.

Among all the tests examined, there were only two that contained inclusions of a measurable size. One of them contained a particle about ⅛ in. in diameter at 100 magnifications, and the other had two of that size. Fig. 15 shows the largest inclusion found at 500 magnifications. The diameter of the majority of these spherical particles was about 1/16 in. at 500 magnifications.

In contrast to the furnace tests, the ladle tests contained inclusions that differed considerably, and have been classified as: glassy, semi-glassy, opaque, dendritic, or network types. These are descriptive of the appearance of the inclusions in each case under reflected light.

The glassy type has a yellowish brown color and is almost as transparent as glass. The reflection of light from the bottom of the inclusions produced white rings and dots, as shown in Fig. 15. On examination under the petrographic microscope it was found that they were of iron and manganese silicate glass.

The semi-glassy type is dark brown and gray in appearance, and the ring and dot effect is not very sharp (see Fig. 15). The opaque type is of a dark grayish color, with almost no reflection from the bottom as shown in Fig. 16. The extracted opaque inclusion under the petrographic microscope appeared to be iron-manganese oxide, forming a glass.

The dendritic type showed a duplex structure, a definite crystalline structure of light gray in a ground mass of dark gray material. The lighter constituent has the appearance of excess FeO precipitated out in a ground mass of iron-manganese oxide glass. The network types were light gray particles surrounded by a dark gray network, the light gray particles being manganosite, surrounded by kneblite (see Fig. 16).

In expressing the relative number of inclusions found in these ladle tests, all those ⅛ in. and over in diameter at 100 magnifications were counted.

The data in Table I show that about 90 per cent of the inclusions in the ladle are of the semi-glassy and opaque type. A small quantity are of the glassy type and a negligible number of the dendritic and network type. It is also true that the greater the oxide content in the inclusion, the larger it is in particle size. The fact that only a small amount of dendritic and network type is present, may be due to the large particle size which increases the probability of elimination by flotation.

In order to check further the results obtained by microscopic examination, these inclusions were extracted by electrolytic means, and classified, as shown in Table I. Analysis of these classifications show that the different inclusions are fundamentally the same,

but the difference in appearance is a result of the variation in the proportion of the component oxides.

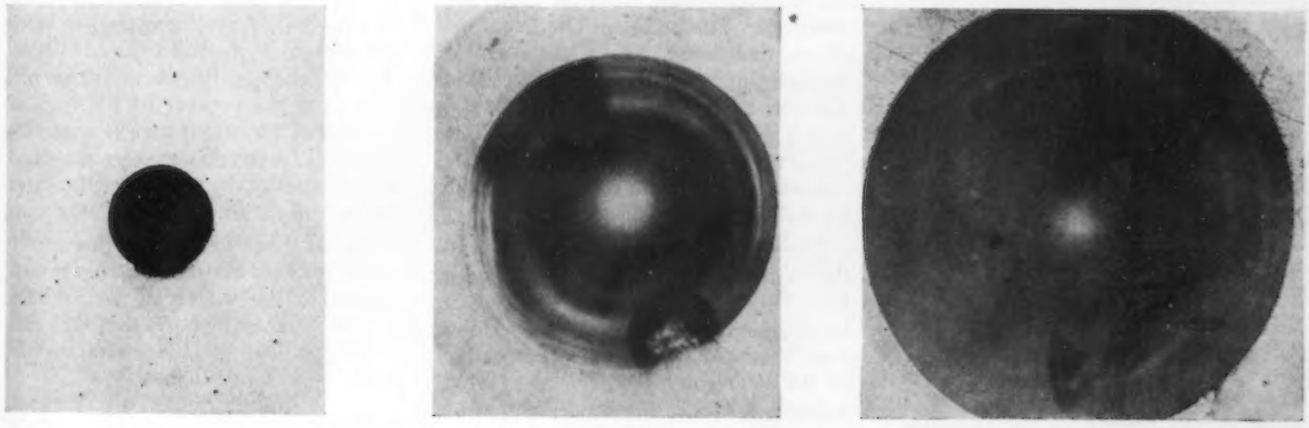
Inclusion Formation Mechanism

As soon as the molten steel begins to fill the mold, a thin solid shell is formed of a composition which is in all probability the same as the average of the molten metal. The solidification immediately starts from the chilled layer, progressing perpendicularly to the wall of the shell. At this point a sharp temperature gradient exists between the shell and the melt.

As soon as solidification begins in this manner, there forms a sharp temperature gradient in front of the advancing crystal. In other words, the molten metal very close to the already solidified metal has a much lower temperature than that of the balance of the melt. The solubility of iron oxide in the steel is decidedly decreased, with the drop in temperature bringing about FeO precipitation. The FeO then reacts with the carbon, forming carbon monoxide, causing an effervescing action. This action continues until the perpendicular growth of the crystals reaches about one-sixth of the entire ingot thickness. At this point the ingot is ready to be capped. After capping, the crystallization changes from columnar to equiaxe.

The most important feature during this solidification is that the reaction between the carbon and iron oxide is an endothermic reaction and decreases in intensity with the falling temperature. Therefore, the concentration of iron oxide in front of the columnar crystals gradually increases as the crystals proceed towards the interior. At the time of capping there must be a curtain of molten metal rich in iron oxide and other impurities just preceding the columnar crystals. The concentration of FeO in this region would gradually grade from high at the bottom portion of the ingot to low at the upper portion, because of the ferrostatic pressure which suppresses the reaction between carbon and iron oxide almost to one-half at the bottom. It should also be remembered that at the time of capping the remaining molten metal has dropped in average temperature and become more viscous.

The inclusions found in the ingot, therefore, appear to be caused by two things: (1) mechanical trapping, and (2) chemical reaction. The iron-manganese silicate, found in the ladle, existing as liquid droplets, must go into the mold with the metal. The larger particles, such as shown in the micrographs, will rise to the top with the help of the effervescing action, as well



ABOVE

FIG. 15—(Left) Largest inclusion found in furnace tests. (Center) Glassy inclusion from ladle test. (Right) Semi-glassy inclusion from ladle test.

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BELOW

FIG. 16—(Left) Opaque type inclusion from ladle test. (Center) Dendritic type from ladle test. (Right) Network type from ladle test.

TABLE I

Classification of Inclusions By Size

By Number	Glassy 8.63 per cent	Semi-Glassy 40.2 per cent	Opaque 50.0 per cent	Dendritic 0.78 per cent	Network 0.39 per cent
Average Diam.	0.0045 in.	0.0050 in.	0.0053 in.	0.0089 in.	0.0125 in.
Maximum Diam.	0.0106 in.	0.0213 in.	0.0291 in.	0.0238 in.	0.0150 in.
Minimum Diam.	0.0013 in.	0.0013 in.	0.0013 in.	0.0025 in.	0.0100 in.

as coalescence of inclusions, and form the scum found on top of every rimming ingot. As previously mentioned, the particle size of the inclusions in the ladle tests varied in size from very minute to the larger sizes shown in the micrographs. It is reasonable to suppose, that particles even smaller than those discernible under the magnifications usable, also exist, possibly even to the extent of colloidal dispersion. At the tips of the progressing columnar crystals a high concentration of these small particles should occur, only to be set free by coalescence and agitation, or be forced further towards the interior. Therefore, the zone of columnar blow holes is clean as shown by Fig. 11 (shown last week). At the end of the columnar crystals, or at the time of capping, these minute particles coalesce as they did at the beginning of solidification. However, the elimination of these inclusions is much more difficult because of the increased viscosity of the cooling melt, as well as the downward current along the solidified wall. This causes mechanical entraption of residual particles along the end of the columnar crystals, or just ahead of them, which corresponds to the inner line of blow holes.

From the standpoint of chemical reaction, as soon as solidification begins the reaction $FeO + C \rightarrow Fe + CO$ also begins. Since this is an endothermic reaction the activity decreases as the temperature falls. Therefore, the elimination of carbon slows up at the same time the FeO concentration builds up. On the other hand the reaction $Mn + FeO \rightarrow MnO + Fe$ is exothermic, and consequently its activity is favored by the falling temperature. At the time of capping or the end of columnar crystallization, the temperature at the end of the crystals has dropped and the FeO concentration has built up, to where the condition is very favorable for this reaction to take place. Since MnO has a very low solubility in the steel, the MnO will separate out as an inclusion, and probably combine with the remaining FeO to form iron-manganese-oxide inclusions. With the minute particles of silica and aluminum which were carried from the ladle, and the particles of alumina, originating from aluminum mold addition, the resulting inclusions would be a combination of all these four oxides. This theory is confirmed by the analysis of inclusions extracted from the ingot at the zone of inner line of blow holes where their concentration is at a maximum.

For the sake of comparison, the average analysis of inclusions from the ladle and those from the ingot are given in Table III. The analysis shows that there was a considerable increase in Al_2O_3 as a result of mold addition and some increase in MnO, with a decrease in FeO and SiO_2. The relatively high Al_2O_3 content is the outcome of complete oxidation of the controlling aluminum addition.

The foregoing discussion might lead the reader to believe that a heat with high FeO content is likely to produce large quantities of inclusions. However, this is not the case. Irrespective of the FeO content of the heat, what actually counts is the concentration of residual FeO after the time of capping, and this is not dependent upon the initial FeO content of the steel. As a matter of fact, high FeO concentration of the steel can assist in the elimination of inclusions, because, (1) the higher the FeO content of the inclusions carried from the ladle, the larger their particle size and easier their elimination mechanically, and (2) the more vigorous the FeO reaction with carbon will be, which further mechanically assists in the elimination of inclusions in molds. In this respect, the temperature of the steel becomes of importance. It not only accelerates the coagulation and elimination of minute particles in the ladle as well as in the mold, but also carries the reaction between the carbon and iron oxide much further with the higher temperature. This undoubtedly increases the rimming action and decreases the building up of FeO concentration. Furthermore, oxidation of manganese in the mold is greatly reduced.

From the foregoing study it is quite evident that the paramount governing factor in the formation of inclusions is oxidation, which is the very nature of rimming steel. Therefore, the complete elimination of such inclusions is extremely difficult. With the present knowledge of steel making it seems almost an impossibility. However, through the careful manipulation of a heat, and the control of its slag, the amount of inclusions can be controlled to such an extent as to meet the standard of quality demanded by the fabricating industries.

The authors feel greatly indebted to those who participated in this investigation, and especially to Dr. William J. McCaughey, whose thorough petrographic study of extracted inclusions was invaluable.

TABLE II

Classification of Inclusions by Appearance

	MnO	FeO	SiO_2	Al_2O_3
Transparent	35.6	34.0	27.2	8.1
Semi-transparent	40.2	30.8	24.6	6.9
Opaque	39.3	37.5	14.3	4.9
Average	38.2	36.7	23.4	6.8

TABLE III

Analysis of Inclusions from Both Ladle and Ingot

	Ladle	Ingot
SiO_2	23.4	17.21
Al_2O_3	6.8	21.50
MnO	38.2	39.66
FeO	36.7	25.30

Republic's Scrap Bill $10,250,000 for 6 Months

CLEVELAND—During the first six months of this year, Republic Steel Corp. used nearly $10,250,000 worth of scrap, according to the August issue of Republic Reports, published for employees of the company.

Undertaking to explain how a big corporation spends the money it takes in, the publication reported that railroads, trucking and steamship lines received more than $8,500,000 in payment of freight bills, not including freight on iron ore and fuel. Fuel expense was more than $5,000,000 and power nearly $2,500,000. The water bill was over $700,000. Iron ore meant an expenditure of more than $7,500,000. Telephones, telegraph and similar service cost nearly $475,000. It was necessary to provide $3,500,000 for the six months tax bill to Federal, State and local Governments. The company paid out in wages and salaries more than $37,750,000.

WHAT'S NEW IN CUTTERS, SMALL TOOLS AND MEASURING DEVICES

By FRANK J. OLIVER
Associate Editor, The Iron Age

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LARGELY pictorial in presentation is this review of new accessories for the machine shop announced by the makers in recent months. Covering new cemented carbide materials to a brinell hardness tester, this correlated digest illustrates threading die heads, hacksaw blades, drill jigs, machine vises, demagnetizers, portable power tools of various types, bore gages and two new uses of dial gages to increase the sensitivity of conventional measuring apparatus.

GRADE 78 is a newly developed cemented carbide material announced by the *Carboloy Co.*, Detroit, containing a combination of tungsten, tantalum and titanium carbides. Grade 78 is said to represent a marked improvement over other titanium carbide grades introduced by Carboloy during the past few years. It is used for taking cuts as heavy as ⅜ in. with feeds up to 3/64 in. per rev. in the machining of steel bars and castings.

A typical example of the results being obtained with grade 78 is shown by its use for finish turning eleven steps on an SAE 1045 steel shaft 35 3/16 in. long, steps varying from 1.25 to 2.78 in. diameter. This operation was previously performed with high speed steel tools with floor-to-floor time of 33 min. per shaft. A grade 78 style 4 Carboloy tool now completes the operation in 18 min.—a 45 per cent reduction in machining time. This does not include the saving in down time and grinding time due to longer tool life. Speed used is 180 f.p.m., with feed of 0.020 in. per rev.

Composite Die Section

A NEW and smaller rolled composite die section, known as section D, has been added to the line of composite die steels produced by the *Jessop Steel Co.*, 537 Green Street, Washington, Pa. The new size was developed for making smaller press dies used in the manufacture of toys, refrigerators, etc. Jessop rolled composite die sections, now available in eight shapes, consist of a tool steel cutting edge backed by non-hardenable soft steel. Principal advantage over solid tool steel sections, lies in the fact that they may be hardened before drilling dowel holes. Composite sections may also be hardened to a slightly higher degree than solid tool steel because the tough soft steel backing cushions the shock in cutting; also, any slight warpage which takes place during heat treatment of the composite section may be readily corrected on a pusher type straightening machine. Being rolled to shape, they save from 28 to 47 per cent, depending on the section, in machining and original purchase weight, as compared to rectangular sections. They may be formed either hot or cold to special shapes without harm to the weld.

Specially Treated Tools

HEAVIER cuts and feeds, at normal or slightly increased speeds, together with long life of tools, are said to be possible with cobalt high speed steel tools hardened by the Nusite process. Developed by W. S. Nusbaum, this heat-treating process is not intended as a cure-all, but to fill the gap between the commonly hardened high speed steels and the various cemented carbides. *Perfection Tool & Metal Heat Treating Co.*, 1740 W. Hubbard Street, Chicago, recently took over the process, and are treating tools by this method, also are supplying bits, squares or flats treated by the Nusite method. Large tools can be tipped with nusite for the sake of economy.

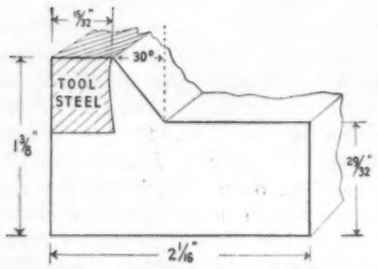
Threading Die Heads

TWO new die heads have been announced by the *Jones & Lamson Machine Co.*, Springfield, Vt. Model 16S is designed for use on small hand screw machines and is provided with an adjustable pull-off and a hand locking lever. Model 16SB die has an external trip and is recommended for use on the Nos. 0 and 00 B. & S. automatics. This die is designed so that it can not open during the indexing movement on high speed machines. Both models are of the same general construction as the J&L tangent dies, except for the chasers, which are equivalent in section to a tangent chaser although of the flat type. By providing both the top and bottom with chamfer and top rake, the chasers may be turned over when one side becomes dull, doubling the life before resharpening. The thread form is ground after hardening.

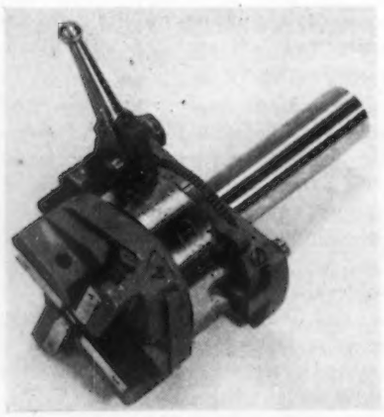
New chaser holders are now available for the model 22 J&L tangent die head for use on hand screw machines and turret lathes where die changes are frequent and a large threading range is required. This die can now be furnished with chaser holders covering ranges of ¼ to ¾ in. and from ¾ to 1¼ in. capacity. Each set of holders will accommodate any diameter and pitch thread within the capacity of the die. Chaser holders with a capacity of 1⅛ to 1½ in. are also available for use with the same die. Model 21 die chasers can be used in this thread. As before, all chasers

Recommended Speeds for Cutting Steels
of any range of hardness with
KENNAMETAL
(The Steel Cutting Carbide Tool)
HARDNESS OF WORK
Rock. C
Brinell
Scler.
PREFERRED SPEED
Surface Ft. Per Min.
65 682 93 20 to 30
60 601 83 30 to 50
55 545 75 50 to 60
51 495 69 60 to 80
45 427 62 80 to 100
40 370 54 100 to 150
35 323 46 150 to 220
30 276 42 220 to 300
25 249 38 300 to 400
For Lower Hardnesses Use Any Speed Above 200

A CONVENIENT lathe chart which gives the recommended speeds for cutting steels of any range of hardness with Kennametal, the new carbide tool bit tip material, has been issued by McKenna Metals Co., 144 Lloyd Avenue, Latrobe, Pa. Cutting speeds recommended on the chart range from 20-30 ft. per min. for work of 65 Rockwell C to 300-400 ft. per min. for work of 25 Rockwell C. These speeds are from two to six times greater than those commonly used with high speed steel tools. The chart also illustrates two designs for grinding tools so as to produce crescent shaped chips or a coiled chip. The reverse side illustrates the correct tool shape for jump cuts; also the terms used in describing angles on single point cutting tools.



SECTION D is a new and smaller size of rolled composite die section stock made by the Jessop Steel Co. For building up small press dies, this section is supplied in any length, weighing 7.25 lb. per ft.



MODEL 16S is a new style of J&L die head provided with an adjustable pull-off and a hand locking lever, for use on hand screw machines.

FOR cutting round holes in any material a hack saw will cut and for production work, Black & Decker Mfg. Co. is marketing a new line of high speed steel hole saws for use with ½-in. or larger electric drills. The firm is also supplying a fine tooth saw for sheet metal and a coarse tooth saw for cast iron, wood and fiber.

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BELOW

SETS of counterbores are now being offered by the National Twist Drill & Tool Co. to meet the requirements of the tool room and small shop.

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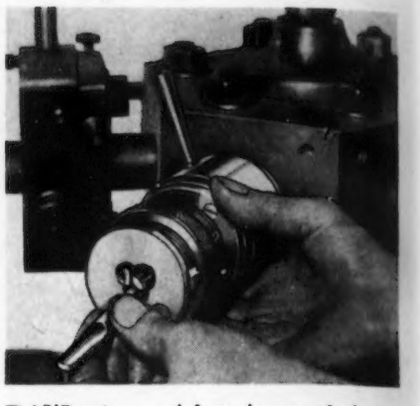
BELOW

IN the new Nos. 400 and 500 series hacksaw blades made by E. C. Atkins & Co., the teeth have been shaped to produce coiled shavings similar to clock springs. The tooth gullet is designed to evacuate the shavings without overloading the gullet area, thus permitting heavier feeds. Set gives a

two-way clearance—from point to base and from front to back of tooth. By combining a twist as well as a bend in producing this set, a group of square top teeth is formed. The blade is furnished in two tooth spacings: No. 400 is recommended for rounds up to 5 in., No. 500 for larger stock.



RAPID set-up and fast change of chasers are featured in a new collapsible tap offered by the Rickert-Shafer Co., Erie, Pa. The tap requires only a quarter turn of the locking ring to release chasers and a few seconds to insert a new set. Setting the holder for tripping is done from the front end by a short turn of the micro-adjusting trip ring. There is also an adjustment to compensate for chaser wear. The same tool serves for either stationary or live spindle use.

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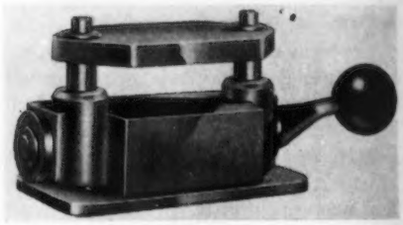

MIJIT pump jig for small parts manufacture weighs less than 6 lb. Working areas range from 1¼x2¼ in. to 3x3 in. Four models are made, incorporating a standard lift of 1 in., with varying locations of guide posts. Positive lock is provided, actuation of the jig being by means of the bakelite ball handle. A product of Esco Engineering & Sales, Inc., 4612 Woodward Avenue, Detroit.

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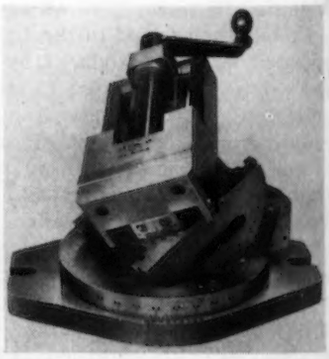
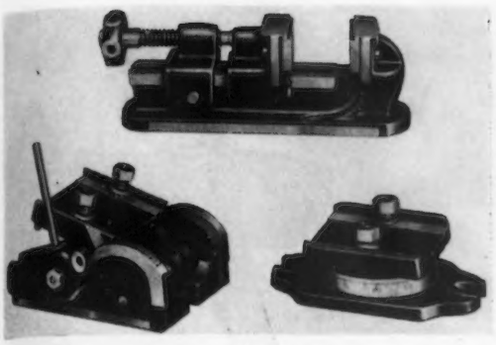
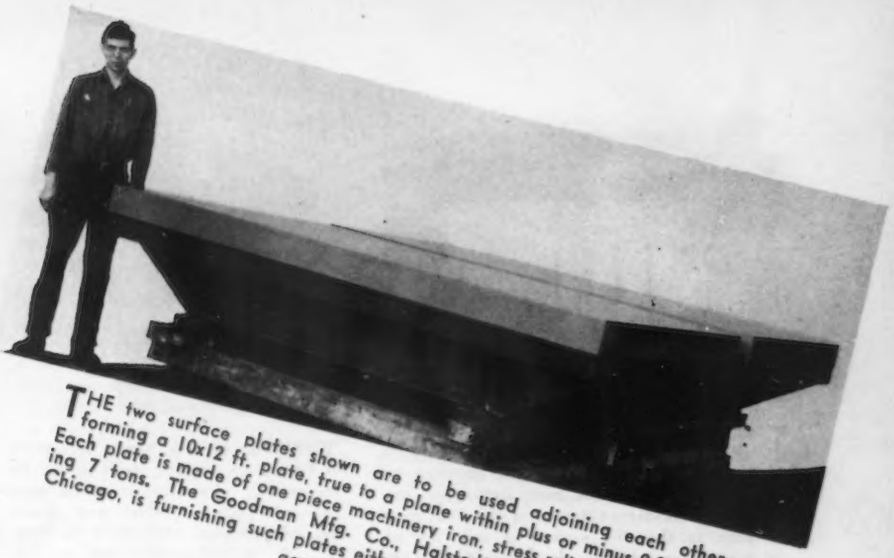


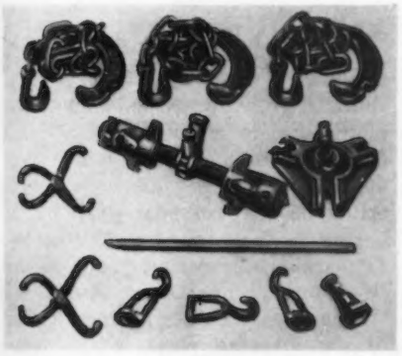
BY the use of a vernier attachment on every angular adjustment, it is possible to obtain an accuracy of setting of plus or minus 15 min. on this improved universal vise, made by the Wesson Co., 1050 Mt. Elliott Avenue, Detroit.



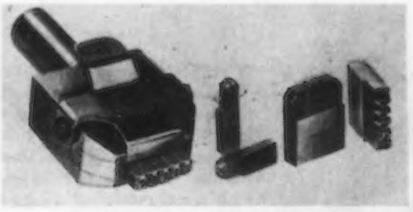
A TILTING base and a swivel base are accessories for the new No. 9 Gem machine vises, made by the J. E. Martin Tool & Die Works, Springfield, Ohio. Vise itself has a capacity of 3 in. and the jaws are 2¾ in. wide and 1¼ in. deep. Design of the sliding jaw is such that when pressure is applied to the work, the movement of the jaw is forward and downward, eliminating the need of tamping down. The set is for use on small, light drill presses and bench millers.



THE two surface plates shown are to be used adjoining each other, forming a 10x12 ft. plate, true to a plane within plus or minus 0.0005 in. Each plate is made of one piece machinery iron, stress relieved and weighing 7 tons. The Goodman Mfg. Co., Halstedt Street and 48th Place, Chicago, is furnishing such plates either hand scraped to a true plane or accurately machined.



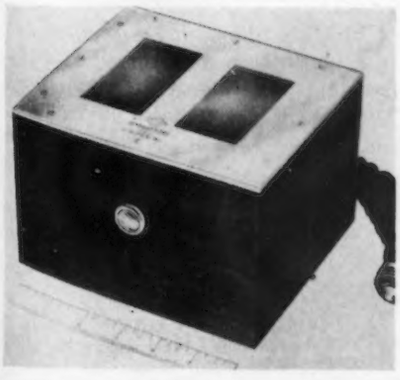
THE several pieces of equipment shown are used in various combinations for various jobs in construction and maintenance work, such as removal of gears and pulleys, spreading or pulling together structural members, pushing, hoisting, clamping, bracing and tensioning. Called the Util-A-Tool, this product of Templeton, Kenly & Co., Chicago, is made in five sizes.



THE Hercules holder and type is made in the press style illustrated, a hand style with tapered shank to fit the hand, or a hammer style. The hardened spring steel clip permits the instant release of type by thumb pressure. Design of body and type is claimed to give long life. This stamp is made by H. O. Bates, 251 N. Broad Street, Elizabeth, N. J.

QUANTITIES of pieces in a basket can all be demagnetized at once in the adjustable gap demagnetizer made by the Blanchard Machine Co., Cambridge, Mass. When connected to a single-phase a.c. circuit, two coils, one on either side of the gap, produce in the gap an intense alternating magnetic field. Placing magnetized pieces in this field and slowly withdrawing them completely demagnetizes them. The gap has a maximum opening of 6 in. The unit is supplied with windings for any of the usual voltages and frequencies.

TYPICAL of the Velocity-Power portable industrial tools, made by the Mine Safety Appliances Co., Braddock and Meade Streets, Pittsburgh, for driving studs, punching holes, bonding pipe, tightening or removing rivets and cutting steel cable in the field, is the driver illustrated. Utilizing the energy created by detonation of a charge of smokeless powder, this unit drives ½-in. solid threaded steel studs into structural steel plate from ⅜ to 1⅛ in. in thickness. With adapters, the tool will punch holes up to ⅝ in. diameter in ½-in. plate and shear various types of rivets and bolts in sizes up to 1 in.



PRIMARILY developed for demagnetizing the new high carbon chrome steels and the molybdenum steels is this unit announced by the H. E. Dickerman Mfg. Co., 284 Wilbraham Road, Springfield, Mass. It can be plugged into a 110-volt a.c. circuit of 25 to 60 cycles. Mahogany box measures 6½x5½x4½ in. and the two poles are 3x1½ in., spaced ⅞ in. apart. A push button operates the demagnetizer and it shuts itself off after using. Dies and punches of all sizes can be demagnetized, and on heavy work the unit can be placed over the die.

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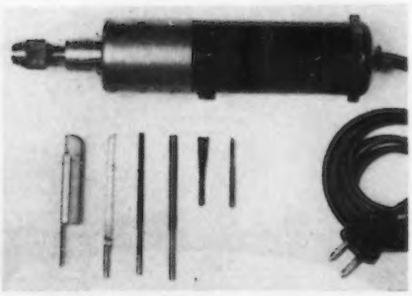
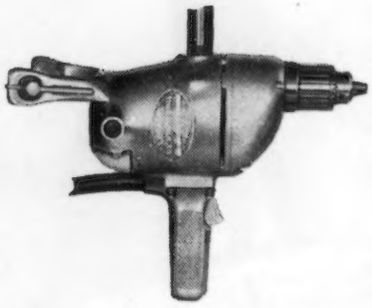
AT RIGHT

IMPROVED angle head developed by the Stow Mfg. Co., Binghamton, N. Y., for heavy duty work with cup-shaped grinding wheels and brushes, sanding and polishing sets, driven by flexible shaft equipment. Spindles rotate in grease-sealed ball bearings, mounted in steel inserts in the aluminum housing. Head can be used for dry or wet grinding. For the latter a valve is contained in the brass cover to control the flow of water. The unit is built to run at speed ratios from 1:1 up to 20:1 reduction. Will fit Stow flexible shafts Nos. 2A, 3A, 4A and 5A.



THE Hoover Multi-Purpose tool with reciprocating motion chips, saws, files, burrs and hones, developing a 6 to 16 lb. push at the end of the file. A push button on the grip gives instant control and the tool may be held so that the work is in full view at all times. Intended for tool and die clean-up work and for pattern making, it is supplied with tools for working on steel, soft metal and wood. The unit is 1⅝ in. in diameter, 8 in. long and weighs 1 lb. Plugs into any 110-volt line. Offered by the H & H Research Co., 1925 W. Buena Vista, Detroit.



TYPICAL of the newly designed line of Van Dorn electric drills is this ½-in. utility model, with close coupled construction, minimum spindle offset and spade handle set horizontally. Weighs 3 lb. less than its predecessor.

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SPEEDWAY low-priced ½-in. drill with streamlined die cast case. Combination breast and end handle puts the thrust pressure directly in line with the drill point.

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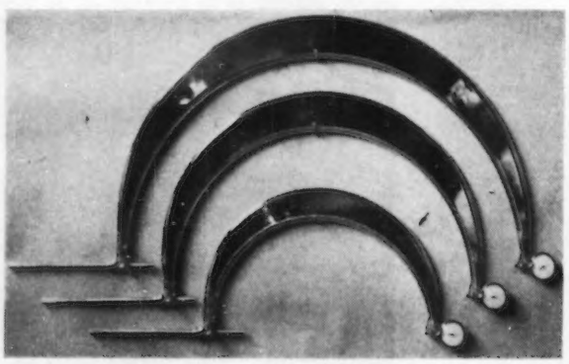
AT LEFT

THROUGH the addition of dial indicators the human element in measuring large diameters is practically eliminated on these Davis tubular micrometers, with frames made of 20-gage steel, welded and normalized. Measurements can be made within 0.0005 in. The Davis & Thompson Co., Milwaukee, is also furnishing tubular bar type micrometers of large size. The light weight construction enables the operator to detect the slightest touch.



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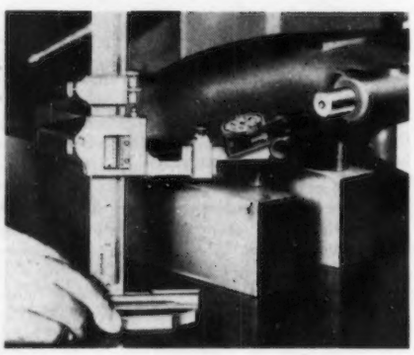
are ground in the thread form after hardening.

Counterbores in Sets

TO their recently developed line of spline taper drive counterbores, the *National Twist Drill & Tool Co.*, Detroit, has added sets of counterbores designed to meet the needs of the average tool room and small shop. The No. 2 tool room set has two holders and interchangeable cutters from 1½ to 1¼ in. diameter inclusive. Pilots from 9/32 to ⅞ in. diameters are interchangeable within the respective ranges of cutters and holders. In addition, there are countersinks for 60, 82 and 90 deg. included angles. A No. 1 set, ranging from ¼ to 7/16 in. diameter, and a No. 3 set having a range up to 3 in. diameter, are also available. These sets come in strong wood boxes, recessed to suit the individual tools.

Cutting Compound for Taps

FOR tapping operations, particularly in castings and forgings of aluminum and similar alloys, Dag colloidal graphite suspended in mineral oils is said to provide extremely free cutting action and long tool life, probably due to the dry lubricating properties of the colloidal graphite adhering to the surface of the threads. In addition, the use of the compound is said to permit easier assembly of bolts and studs and to prevent freezing of the threaded parts in the tapped holes. Where tapping equipment is provided with a circulating or volume supply system, the concentrated Oil Dag may be diluted in the ratio of 15 oz. of colloidal graphite to 2 gal. of mineral oil, according to *Acheson Colloids Corp.*, Port Huron, Mich.



BROWN & SHARPE No. 725A dial attachment shown in use with a vernier height gage. Dial reads in 0.0001 in., and to provide the rigidity for close measurement, the adjustable swivel slides on a dovetail on the bottom of the body of the attachment. The new No. 725 dial attachment is somewhat similar in design, but is sensitive only to 0.001 in. It can be used in conjunction with either the No. 585 vernier height gage or with the Nos. 621 and 622 surface gages. The dial gages are compact and have low friction, jeweled bearings.

Portable Electrical Tools

SEVEN units in the *Van Dorn* line have been redesigned for less weight, more compactness and greater durability. The ½ in. utility drill, for example, is 3⅛ in. shorter than the

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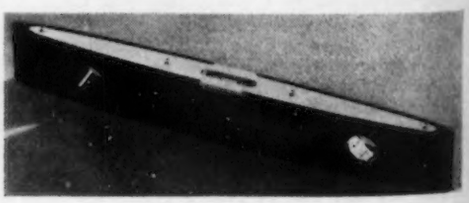
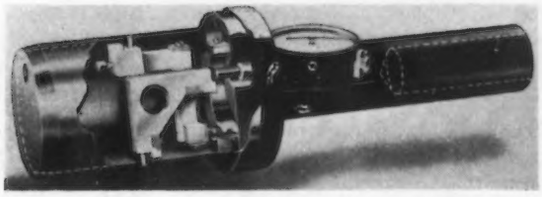
BELOW

A BODY of molded bakelite is used for this streamlined level, made by Millers Falls Co., Greenfield, Mass. The resistance that plastics offer to wear and abrasion, heat and moisture was an important factor in the selection of this material, also the light weight and permanence of finish.





ABOVE

SHEFFIELD'S visual gage reed mechanism has been adapted to a new indicator plug gage for checking cylindrical bores while they are still set up in the finishing machine.

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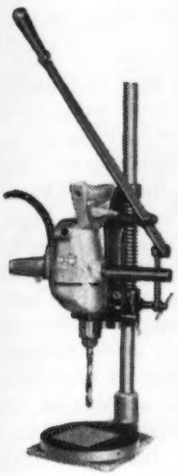

AT LEFT

REDESIGNED Van Dorn drill stand for the firm's new line of drills. The smaller stand will accommodate the entire range of end handle drills from the Holgun up to the 3/8-in. utility drill, the Scrugun, Nos. 12 and 22 screw drivers and the No. 22 tapper. A larger stand will accommodate the new 1/2-in. utility drill, the new 3/8-in. heavy duty drill, the 1/2-in. Junior and the previous model 1/2-in. standard drill.

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AT RIGHT

THREE fixed, but adjustable, contact points locate the two measuring points diametrically and perpendicularly with the cylinder in the new model 1200 Federal bore gage. The locating contacts are set directly to size in relation to the nominal diameter with a micrometer or master.

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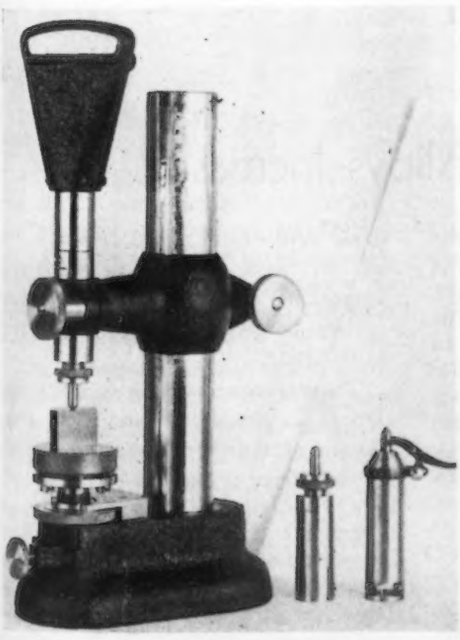
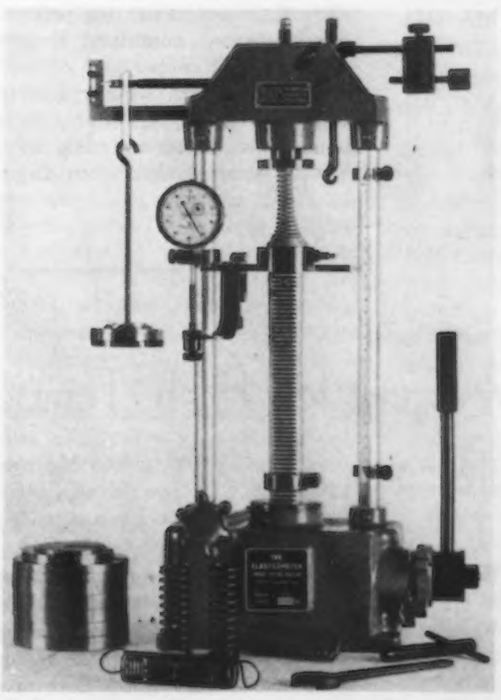
previous model, weighs 3 lb. less and is said to have perfect operating balance. Setting the spade handle horizontally is also an advantage in confined space. Other features include threaded chuck mounting, deep groove ball bearing and needle bearing on spindle, ball bearings on the armature shaft of the universal motor and spline mounting of the spindle gear. The other redesigned units are the 3/8 in. utility and heavy duty drills, the 5/16 in. heavy duty, and the 1/4 in. heavy



IN conjunction with either of the two adapters shown and the pillar stand, the Mikrotast indicator is converted into a high precision bench inspection gage. Fan gages can be had reading to 0.00005 or 0.0001 in. or in metric units. The thumb nut on the ball pointed adapter has a fine thread, and a slight turn lifts the gaging point out of contact with the work. The 2 3/8 in. diameter lapped table is equipped with micrometer adjustment from below and under it is a domed table. A friction device prevents dropping of the instrument when making adjustments of the arm on the vertical pillar. Capacity is for 5-in. rounds. Sold through the Coats Machine Tool Co., 110 West 40th Street, New York.

FOR testing the load of coil springs, either in compression or in tension, to very accurate length measurement, the model R-80 Elasticometer has been equipped with a dial indicator reading in 0.001 in. and having a range of 1 in. Travel of the lower compression plate is transmitted to the indicator by suitable means. Length capacity is up to 12 in. Load capacity is 1/2 oz. to 175 lb. Life of the weigher scale has been considerably lengthened through a yoke that arrests the up and down swing of the weigher scale beam. This instrument is also sold through the Coats Machine Tool Co., New York.



IN this improved type of Brinell testing machine, the work is placed on a large stationary table instead of on a small screw table, and the ram is sufficiently long to cover the range of the machine. Ram movement for adjustment is rapid but the actual test load is applied at a relatively low speed. Operation is hydraulic throughout. Two standard sizes are available: No. 1 has a throat depth of 6 in., maximum height of 12 in., and table 12x20; No. 2 has throat depth of 9 in., maximum height 18 in., and table 17x24 in. The unit is made by the Detroit Testing Machine Co., Detroit.

duty. *Van Dorn* has also redesigned two of its drill stands so as to accommodate these newly designed drills.

BLACK & DECKER has also redesigned five of its electric drills, the ½ in. utility, the ⅜ in. utility and heavy duty drills, the 5/16 in. heavy duty and the ¼ in. heavy duty. These improved drills are all shorter in length and lighter in weight than their predecessors, and on each the spindle offset has been reduced to a minimum.

A NEW standard ½ in. electrical drill that departs radically from former models in both design and price (30 per cent lower) has been announced by the *Speedway Mfg. Co.*, Cicero, Ill. Model 89 has a streamlined die cast case finished in lacquered bright metal and blue crackel finish. A new combination breast and end handle is said to increase the naturalness of the grip and drilling accuracy. Motor is a high torque type that drives the spindle at 500 r.p.m. and is claimed not to stall under a 500-lb. thrust when drilling at capacity. Bearings are self-aligning oilless types.

Indicator Plug Gages

THE well-known reed mechanism used in its visual gages has been applied by the *Sheffield Gage Co.*, Dayton, Ohio, in the construction of an indicator plug gage primarily intended for checking cylindrical bores while the work is still set up in the finishing machine. The instrument is equally useful for final inspection. It can be read to "tenths" and interpolated to fractional tenths.

The unusual features of this gage result from the recently perfected reed bell crank assembly which provides two floating contact points and makes any condition of bellmouth, taper, sags or ridges immediately apparent on the dial scale. Two gaging points are carried diametrically opposite each other, both freely moving in correlation with each other. Thus any irregularity on either side of the bore is instantly indicated on the dial and the effects of thrust pressure between part and gage are minimized. Another feature is the ability with this gage to check a bore beyond a pilot sleeve which may be as much as 0.010 in. smaller in diameter than the bore itself.

ANOTHER new type of indicating cylinder or bore gage is the model 1200 developed by *Federal Products Corp.*, 1144 Eddy Street, Providence. The chief feature is the use of three fixed, but adjustable locating points that position the gage positively in relation to the cylinder wall and assure that the two measuring points are diametrically opposed and perpendicular to cylinder's axis. Creepage, scoring and distortion of the cylinder wall are said to be eliminated. The motion of the sensitive contact is transmitted to the indicator directly through a rod suspended by a flat spring and a bellows spring, eliminating internal friction as in the case of the Sheffield reed construction. Standard length of contact to the lower grip is 10 in. Two ranges and adjustment are available, covering diameters from 2⅞ to 5 in. and from 5 to 10 in. Indicator reads in 0.0001 in.

Corrosion Resistance of Cu-Ni Alloys Increased

TIN and zinc added to the copper-nickel alloys used in the construction of dairy-processing equipment have a tendency to inhibit the solubility of the copper and thus limit the development of oxidized flavor in the milk, experiments at the Davis Campus of the University of California, at Davis, Cal., have revealed.

In experiments conducted at Davis a study was made of the corrosion of certain copper-nickel alloys in milk during the pasteurization process. The alloys studied contained from 62 to 66.5 per cent copper and 20 to 31 per cent nickel, with smaller amounts of tin, lead, zinc, chromium, iron and manganese added to some of them. Results showed that when from 3 to 8 per cent of tin and 3 to 4 per cent of zinc were included in the alloys, corrosion rate in the milk is reduced and the development of oxidized flavor is delayed.

The experiments were conducted by Dr. C. L. Roadhouse and J. L. Henderson of the dairy industry division of the school.

New Steel for High Temperature Service

A NEW alloy steel in tubular form for elevated temperature service has been developed by the Babcock & Wilcox Tube Co., Beaver Falls, Pa. Known as Croloy 7, this new steel is economically priced and intermediate in properties between company's Croloy 5 and Croloy 9. Nominal analysis of Croloy 7 is 7 per cent Cr, 0.15 maximum C, 0.45 to 0.65 Mo, and 1.00 maximum Si. Several applications of this new product have already been made.

Croloy 7 is a result of metallurgical research program Babcock & Wilcox has carried on for some years in endeavor to develop better steels for high temperature and high pressure service. The program was largely responsible for the development of many tube alloys in present use, including such alloys as 5 per cent Cr with Mo addition; 2 Cr-0.50 Mo; 9 Cr-1.25 Mo, and further modification of the 2 Cr-0.50 Mo type by addition of higher percentage of Mo to obtain better creep strength.

Throw Away the SCRAP BARREL

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By S. A. MOHT

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IN cold drawing steel, a sectional die frequently can be used to great advantage, particularly so for complicated shapes which involve severe wear at certain points. However, such dies must have a correct design. This first section of a two-part article describes the construction of such dies in detail. Other articles which complement this consideration of sectional dies for cold drawing appeared in the Aug. 3 and 10 issues.

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A DISCUSSION of built-up, or sectional, dies involves consideration of a field as old as the art of die making itself. In fact, the old-time die maker, considering the equipment he had to work with, found it much more convenient to build his dies sectionally rather than attempt precision work in a solid die.

The development and use of the sectional die in other industries has, in general, been somewhat ahead of anything attempted in the cold drawing of steel. Of course cold drawers have turned out many difficult shapes with sectional dies; but, frequently, full advantage has not been taken of the almost unlimited possibilities of the sectional die in cold drawing steel, and not enough careful consideration has been given to the design so as to enable the die to deliver its utmost in production. The writer has designed and built sectional blanking and piercing dies for the electrical industry, having more than 100 parts to a die. Naturally, a die of this complexity is both impractical and unnecessary for cold drawing steel, but the fact remains that such a type of die was designed and built for rapid and economical replacement of sections subject to severe strain and wear. It was not constructed just because it was quicker and easier to build than a solid die.

The replacement of worn parts should be considered when designing and building sectional dies for cold drawing some particular shape. Too frequently, the built-up die in cold drawing is used as a make-shift arrangement with little consideration given to the balance of the component parts. Just as frequently the resulting bar is horrible to behold. Then the die is unjustly condemned, and the shape is reproduced in a solid die. Such action is quite costly if the shape happens to be complicated. And, whereas the shape drawn through the solid die may meet all requirements, the die often is short-lived and requires constant attention. In some shops, it is this lack of planning when designing built-up dies that is responsible for curtailed production from the bar machines, unnecessary die cost and an active scrap barrel.

These three unnecessary detriments to profits can be practically eliminated by establishing an engineering division such as was described in the article of Aug. 30. In such an engineering department each individual shape is carefully studied before deciding whether or not it is advisable to use a built-up die for drawing the particular shape under consideration. And, if a built-up die is chosen, it is designed by someone thoroughly familiar with die construction and cold drawing problems.

Figs. 1 and 2 show two views of a die frame which if properly made will give years of service. There is nothing new or original in the die frame shown —it has been used for years and is judged to have proved far superior to other types of die frames in general use. Not only has it the necessary strength to withstand tremendous strains, but due to the simplicity of design the cost of construction is low. Regardless of the length of time it has been in use, the frame itself and the general design of the dies used are frequently guarded as important secrets.

One of the most vital factors in sectional die work, often overlooked, is the importance of having die frames accurately made and sturdy enough to withstand tremendous strains. Die frames and screws made of vanadium steel and then heat treated have been found to be highly satisfactory. The screws should be as short as possible and as large in diameter as possible without weakening the frame; for both are called on to withstand the pull of a wrench 3 to 6 ft. in length, which is often necessary in order to tighten the dies enough to avoid "high corners." All shims used, under either the die or screws, should be hardened tool steel. The opening in the face of the frame which rests against the bull-plate of the bar machine should be as small as possible, taking into consideration the necessary clearance for

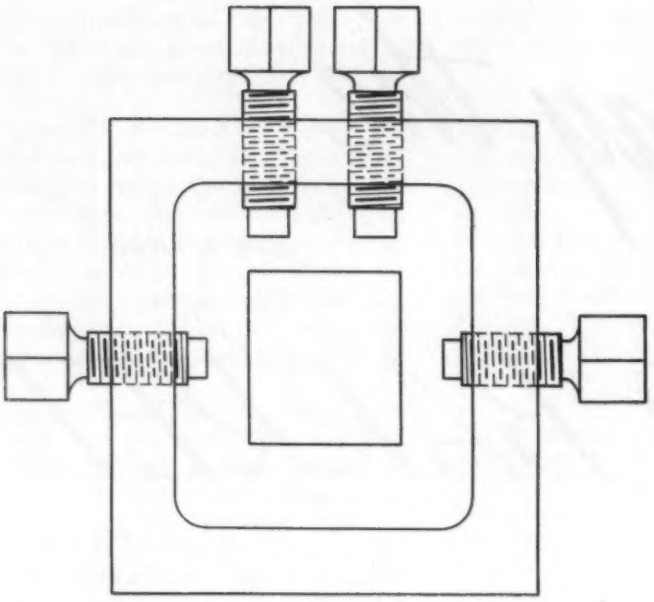


FIG. 1 — This type of sectional die frame is of highly satisfactory design. Vanadium steel, heat treated, has adequate strength to withstand the great stresses involved.

the largest size bar to be drawn through any particular frame.

It is not uncommon for die makers to spend days making a sectional die, and on its completion assemble the die in a frame sprung all out of shape simply because no better frame is available. Naturally it is practically impossible to assemble the die properly, and the resulting bars are off-shape, scratched, over or under size, or have high corners wherever the bar made contact with a junction of separate sections of the die. Bars in this condition find their way into the scrap barrel and the die often ends up in the same place. All this because someone sincerely believes it is a commendable policy of economy to refuse to furnish new die frames for a cold drawing department.

Only recently a cold drawing department in a rather large mill was encountered which for five years had tried to get new frames without success. If the value of the cold drawn steel and ruined dies from this one department, that were returned to the melt floor via the scrap barrel because of obsolete frames, were applied to build new frames, this particular mill would have a supply of frames sufficient for as long as it intends to cold draw steel. Too, some badly ruffled dispositions would be restored to normal.

Fig. 3 shows three views of the type of piece generally used for the top and bottom dies in drawing standard shapes, such as squares, flats, hexagons, or any other shape having a flat surface. These dies made in the following sizes—1½x1¾x3 in., 1¾x2x5 in., and 2½x2¾x8 in.—will as a rule

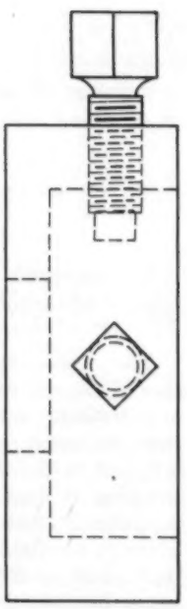


FIG. 2 — Side view of the sectional die frame shown in Fig. 1. The screws should be as large as possible without seriously weakening the frame.

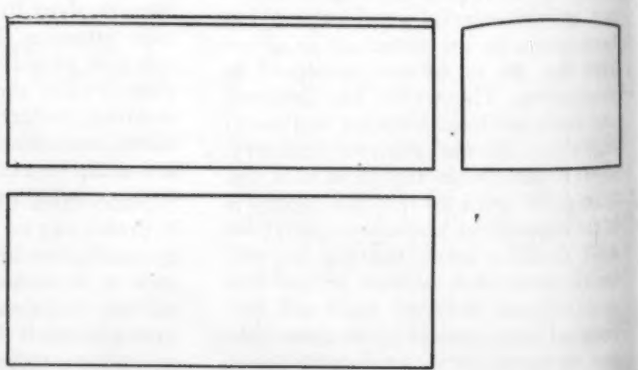


FIG. 3 — Three views of the type of piece generally used for top and bottom dies in drawing standard shapes.

be found sufficient to draw most jobs entering a cold drawing department. The same convex radius of 5 in. (which is milled with a form cutter before the die is hardened, and ground with a very fine grain wheel after the die is hardened) is maintained regardless of the length of the piece. This radius serves three purposes: First, it automatically centers the dies which come in contact with each other; second, it prevents any side movement, or twist of the dies while under drawing pressure; and third, it forces the center dies to move in a straight line when adjustments are being made for size. By using an inexpensive grinding fixture and regrinding the radius whenever necessary, it is always possible to have perfect dies on hand when needed.

All sectional dies should be made of high-speed steel for maximum efficiency; and dies of the type shown in Fig. 3, that require no filing, should after hardening be tempered just enough to relieve the strain, thus leaving the die as hard as possible. Other high-speed shape-pieces that require filing should, after hardening, be drawn to a Brinell hardness of 653 to 682. These pieces should be packed in charcoal, both when pre-heating and when bringing the pieces to the actual quenching temperature, to prevent the formation of any scale which would have a tendency to ruin the sharp edges present on the die or change its size. In Fig. 4 are shown three views of a die to be used in pairs for drawing 0.375 in. hexagon bars, in conjunction with a pair of dies such as that shown in Fig. 3.

It will prove more economical in making the dies shown in Fig. 4 to machine a bar of steel long enough to produce a number of dies rather than machine a pair at a time. When milling the 5-in. concave radius shown at A, care should be taken in making the cut as smooth as possible to avoid leaving an excess amount of stock which will require excessive grinding

after the die has been hardened. These surfaces should be smooth enough to require grinding of no more than 0.010 in. of stock to attain finish size. After the bar has been cut into dies of the desired length, an inexpensive fixture for the lathe designed to machine four dies at a time is used in form turning the 120-deg. angle at 5-in. radius, as shown at B in Fig. 4. On completion of this operation, No. 2 cut pillar file is used to remove any tool marks present on the surfaces forming the 120-deg. angle. In this operation, as in turning, it is necessary to keep the angle centered with the thickness of the die. For this purpose, when filing the die a hardened and ground 120-deg. angle gage, as shown in Fig. 5, is used. By slipping this gage onto the blade of a square and there securing it in place with the spring A, between the top of the square-blade and the boss at the top of the gage, there is obtained a tool that is both adjustable and accurate. The die maker when performing this filing operation both before and after the die is hardened, easily maintains the 120-deg. angle and its proper center position by applying the square to first one, then the other face of the die, leaving the gage on the square-blade in the position originally set; thus is determined which surface of the angle requires the most filing to form a perfect 120-deg. angle in the center of the die. The operation is quite simple and even much quicker to perform than the description would indicate.

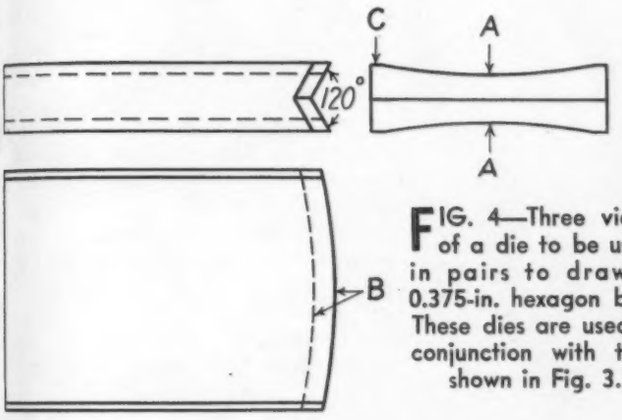


FIG. 4—Three views of a die to be used in pairs to draw a 0.375-in. hexagon bar. These dies are used in conjunction with that shown in Fig. 3.

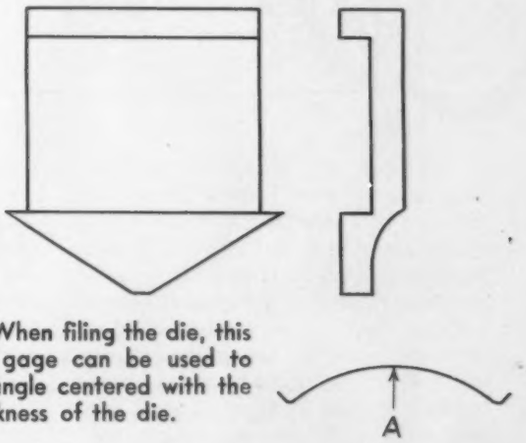


FIG. 5—When filing the die, this type of gage can be used to keep the angle centered with the thickness of the die.

In built-up dies of this type the center dies determine the bar size, when properly adjusted and in contact with the dies shown in Fig. 3.

Assume a cold drawn bar of 3.50 per cent nickel steel heat-treated, in a Brinell hardness range of 262 to 302 and having a diameter of 0.375 in. By referring to the charts described in the issue of July 6, it is determined that the dies must measure 0.373 in. to produce a bar of the desired size. This is accomplished by grinding each concave radius (with a hard, fine-grained emery wheel 10 in. in diameter, which forms the necessary 5-in. radius) until the proper die size of 0.373 in. is attained. The size of these dies having a concave radius is determined by measuring the center of the die, at A in Fig. 4, with a pair of point micrometers. In this grinding operation, it is good policy to grind the 5-in. radius on a taper of not more than 0.0015 in., making the thinnest end of the die opposite to the end having the 120-deg. angle. By grinding the die tapered, the possibility is eliminated of the top and bottom dies not forming a tight seal at the junction of the angles forming the shape, thus preventing "high corners" on the bar.

In Fig. 6 is shown a set of dies to be used for drawing 0.375 in. hexagon bars assembled in the die frame. At this point note that all drawing surfaces on all the dies assembled have been made on a radius, forming a radial drawing surface similar to the drawing surface of the center bearing solid die described in the issue of Aug. 3. Shown at A and B, Fig. 6, are dies similar to the dies shown in Figs. 3 and 4. A hardened tool steel shim is shown at C. Either screw D or E may, if necessary, be used to adjust the dies B, to correct any error made when setting the die up.

When assembling the dies in the frame, it is always good policy to set the dies B about 0.004 in. closer together than the distance measured between dies A. The reason for this is that the tremendous pressure against the dies created as the bar starts to draw is extended to the screws and any looseness of fit between the screw threads and the threads in the die frame allowing the dies to move will become apparent when measuring the bar. This movement, if the threads fit properly, should not exceed 0.002 in., and any further adjustment necessary is made with the dies forced by the bar tight against the screws. Thus in turning either screw the screw is moved in the same direction and in line with the pressure exerted by the bar. When drawing bars of large diameter, it is almost necessary to make adjustments in the manner just described. All adjustments should be made while the bar is being drawn, thus allowing the bar machine operator or die maker to check the bar size. If the bar is oversize necessitating bringing the dies closer together, often the strain put on the screws in attempting to crush the dies into the bar in order to gain the necessary few thousands of an inch results in broken screws or complete failure, leaving the bar oversize.

When a die of this type is removed from production due to a "ring" forming, or high corners (a common ailment of this type die, invariably caused by defective die frames allowing the dies to separate while under pressure), it is a simple matter to correct the condition. The top and bottom dies may be re-ground or replaced with another set (it is good policy to always have on hand a number of these dies ready for instant use). The center dies the die maker files as previously described until all trace of the "ring" or "high corners" are removed, and in a very short time the die is again ready for production. In any adjustable sectional die regardless of its shape, the general procedure

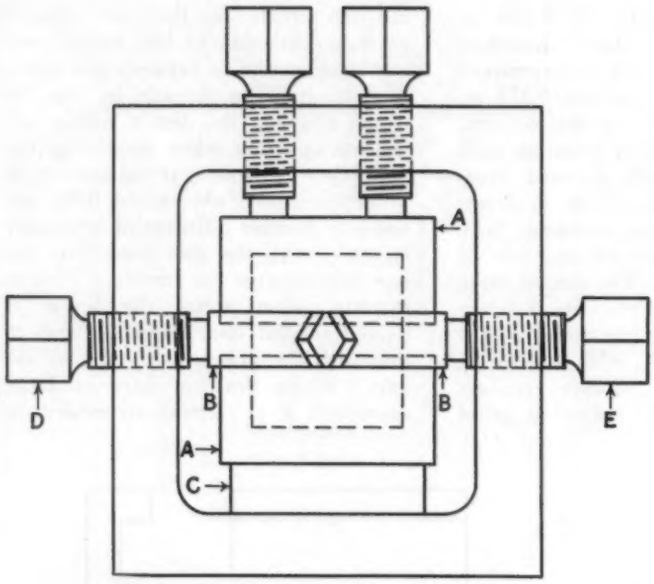


FIG. 6—A set of dies to be used for drawing 0.375-in. hexagon bars, assembled in a die frame.

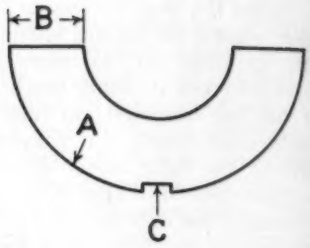


FIG. 7—To draw this special section required construction of a suitable sectional die. Maximum wear is at the keyway C.

is the same in making the separate parts, except when making the center dies for drawing flats, squares etc., which are milled and ground on the drawing surface. The drawing surfaces for these dies are ground square with the two surfaces having the 5-in. concave radius by laying the die on the flats, C in Fig. 5, which have been left for this purpose when milling the radius A. In this operation a disk grinder with an exceedingly fine-grained steel-bound disk wheel is used, and, by setting the grinder table absolutely square with the flat surface of the wheel, the die maker after the die is hardened proceeds to grind the die free-hand following the contour of the milled radius.

One of the gravest and most costly mistakes made in cold drawing shapes is disregarding the importance of the breakdown, that is reducing the steel to the proper size and shape for finish-drawing. With the exception of flats and squares, the writer, when designing and building sectional cold drawing shape-dies, seldom considers the use of a sectional die for breaking down a job if it can possibly be avoided. The very nature of the sectional die in forming sharp corners is contrary to sound cold drawing principles insofar as its use as a break-down die is concerned. Every sharp corner on the bar left by the break-down die is a potential starting point for trouble. Regardless of how or of what grade of steel the finish-die is constructed, eventually these corners will cause a scratch either in the bar or in the die, and more often both. Especially is this true if the bar is of heat-treated and non-corrosive steels. Contrary to the evidence piled up each day in the scrap barrels, there persists in some shops a sort of gamblers' faith that a shape after being broken-down off-size and having sharp ragged corners can by the finish-die be magically transformed and beautifully blended into a work of art wonderful to behold. Were it true, the task of the cold drawing shop would be enormously simplified.

It is questionable which operation is most important in cold drawing steel —the breakdown or the finish draw. If the errors caused by the break-down die are insurmountable, the bars are scrap. On the other hand, if the finish-die is incorrect, again the bars are scrap.

On occasion, officials in some shops are production hungry, and insist on drawing steel through break-down dies regardless of their condition, just so long as the shape and the size of the bar may be recognized. Other officials, equally as anxious for maximum production, give the matter more serious thought and insist upon break-down dies having the same degree of accuracy as the finish-die. This latter view seems by far the most sensible.

As a rule, of all steel cold drawn the round shape should cause the die maker the least trouble regardless of whether or not it is drawn in coils or bars. But, such is not always the case, as witness a recent occurrence in one shop. The steel involved was of a special mix and very hard. In drawing this steel during the last break-down operation, the die was badly scratched with approximately half of the drawing surface in the die affected. No other die being available, instead of discontinuing the job until a new die could be made, the die maker was ordered to remove the scratches from the drawing surface of the die, which resembled somewhat the surface of a newly plowed field. One look at the die and it was obvious to the die maker that any regard for size and roundness was useless if the die was to be polished smooth.

After the die was "smoothed up" it was again placed in production, the result being that instead of the steel after drawing being round it was elongated 0.006 in. The operator running the drum on which the coils of steel were being drawn was an old hand at the game and knew from past experience the trouble in store for someone if the steel was allowed to reach the finish-draw 0.006 in. out of round. He called to the attention of his immediate superior the condition of the die and what the inevitable result would be if the job was continued. It so happened that this was a hurry-up job and the annealing ovens were waiting for the steel. So, the superior, being perhaps a gambler at heart, decided to take a chance and ordered the operator to proceed. The operator was reluctant to proceed so he took the matter up with a higher authority. This authority also was a gambler, which left no alternative for the operator but to draw 2000 lb. of steel 0.006 in. out of round. After the break-down and processing of the steel for the finish-draw, the proper finish-die was placed in the machine and the operator started drawing steel.

Before finish-drawing the steel measured 0.610 and 0.604 in. in diameter. The finish-size called for 0.590 in. in

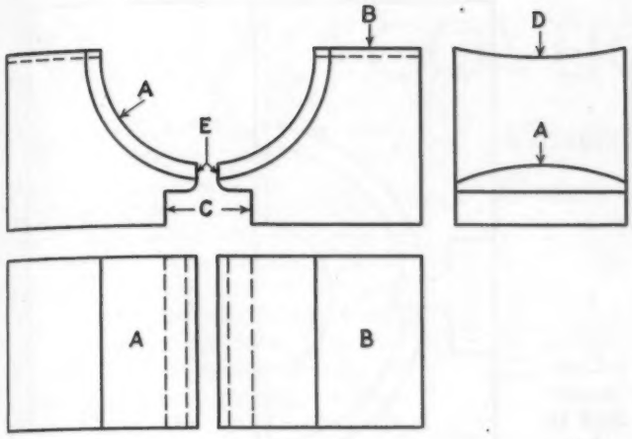
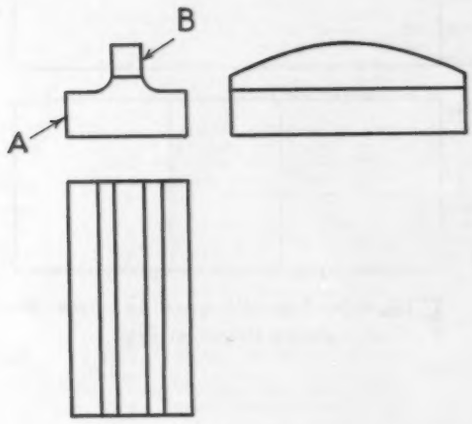


FIG. 8—Bottom sectional die used to draw the shape shown in Fig. 7.

FIG. 9—Keyway section of the die used to draw the shape shown in Fig. 7.



diameter plus 0.002 in. minus 0.000 in., with a limit of 0.001 in. out of round. Thus, there was a very hard steel 0.006 in. out of round with only 0.014 in. on the small diameter with which to work in attempting to correct the condition. After passing through the finish-die the largest diameter of the "round " measured 0.590 in., the small diameter 0.586 in.—a reduction of 0.002 in. from the amount of the original error. But this 0.586 in. diameter was not only 0.004 in. under the desired size, it was also smaller than the diameter of the hole in the die. This "phenomenon" called for a consultation of officials, and a theory was advanced that in order to obtain a perfect round again it would be necessary to stationary the small diameter, while the larger diameter was reduced to conform with it. Acting on this theory, two die makers were instructed to rush through dies having the same diameter as the small diameter of the round before finish-drawing, or 0.604 in. On completion of one of these dies, drawing was resumed, and this time the diameters measured 0.606 in. and 0.603 in. respectively. Obviously there was something wrong with the theory. After trying various experiments and never drawing a piece of steel closer than 0.002 in. out of round, the job was abandoned in disgust with a loss of 2000 lb. of steel and nine days of working time. One important fact had been overlooked, that being that when cold drawing steel the steel stretches; and, in using small drafts when cold drawing small diameter shapes or rounds, unless the draft is evenly balanced there is a strong tendency for the side, or diameter, offering the least resistance by the die to stretch the most. In other words, this part of the shape or round is not drawn through the die—it is stretched through, losing size even though it makes no contact with the die. This accounts for the fact that the small diameters of the round just mentioned were smaller than the diameter of the hole in the die.

All this indicated that the break-down die in reality is something far more than just a piece of steel with a hole punched through it.

The sectional dies shown in Figs. 3 and 4 are relatively simple to make, with the majority of the operations being completed by machine work, thus reducing to a minimum the slower hand work such as is required in constructing solid type dies.

In contrast to the sectional dies just mentioned there is another type of sectional die having no adjustment. This type requires a sound knowledge of cold drawing fundamentals when designing and better than average ability on the part of the die maker to build. Such a die was used to cold draw the shape shown in Fig. 7. This shape was drawn from tool steel having a Brinell hardness range of 228 to 241, and the measurements were very exacting with the customer specifying clear, sharp corners free from scratches. The specifications called for the following dimensions—radius A, 1.250 in. plus or minus 0.001 in.; thickness throughout the shape at B, 0.610 in. plus or minus 0.0005 in.; the keyway C was 0.050 in. deep minus 0.000 in. and plus 0.001 in.; and the width was 0.2505 in. wide minus 0.000 in. plus 0.0007 in., and located central with the diameter plus or minus 0.0005 in. The steel was rolled as near the shape as possible, leaving approximately 0.060 in. for cold drawing purposes, disregarding the keyway C.

The rolled shapes, after being duly processed for cold drawing, were delivered to the cold drawing department ready for an inevitable bout with old man trouble. Hostilities were not long in starting. There was no planning regarding the method of drawing conducive to producing the most satisfactory results and the correct type of die to be used for overcoming the difficulties that are bound to arise when drawing a shape of this kind. A sample of the shape desired, which was not cold drawn but machine made, had been forwarded by the customer along with the necessary instructions regarding limits. These were given to the die maker, who was then left to his own resources to build dies that would produce a shape corresponding to the sample. The die maker proceeded to build a solid break-down die (to avoid forming sharp corners on the bar) that would leave 0.025 in. for finish-drawing and also form one-half of the depth and width of the keyway. The finish-die was built as a sectional die, making the bottom die in one piece with the shape being filed by hand. The top die was constructed similar to the three views of the die shown in Fig. 10.

After completion of the dies, five bars were drawn through the break-down die and sent to the annealing room preparatory for finish-drawing. On the return of the steel, in attempting to draw-finish it was discovered there was no way of bringing in line

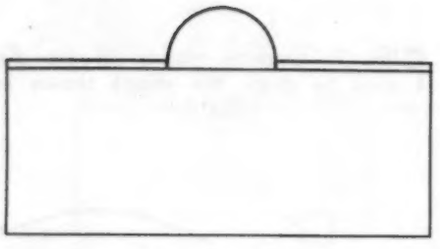


FIG. 10—Top die used to draw the shape shown in Fig. 7.

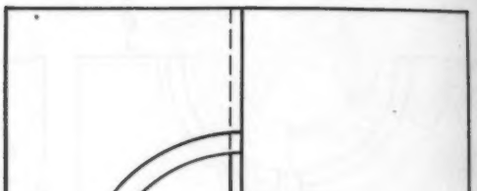


FIG. 11—Completely assembled die used to draw the shape shown in Fig. 7.

the partially drawn keyway in the bar with the projection in the bottom die necessary to complete the shape and size of the keyway. After this discovery, it was decided to file for a short distance an angle on the sides and top of the projection in the bottom finishing-die forming a wedge shape affair small enough to enter the keyway in the bar. This had the desired effect of centering the bar in the die, but the resulting drawing action was both undesirable and unlooked for. Acting like any wedge, this projection instead of drawing, spread the steel surrounding the keyway causing the bars to rip and tear at that point. In attempting to correct this condition, another break-down die was built leaving only 0.010 in. draft in the keyway for finish-drawing. After removing the scratches from the finish-die another attempt was made to draw the bars which had been drawn through this last break-down die. The result was, if anything, worse than the previous attempt. The bottom die was completely ruined.

It became necessary to re-design and build suitable dies for the job. It was obvious that the keyway must be drawn in one operation. In doing this, it was also obvious that the part of the die performing this operation would be subjected to severe strain and wear. This fact eliminated any possibility of using a type of die preventing the replacement of this section. With these facts determined, a bottom sectional die, shown by the views in Fig. 8, was designed and built. This die was made in one piece of high speed steel. The radius A, was bored straight, in the lathe, leaving 0.010 in. to grind after hardening. Next, a 10-deg. throat angle was turned on the radius from each face of the die to later be blended, as described in the Aug. 3 issue, into the radius forming the bearing of the die. Then the slot C, was milled across the bottom of the die to accommodate the boss A, on the section shown in Fig. 9. After the 10-deg. angle had been blended into a radius, and the 5-in. radius shown at D in Fig. 8 had been milled, the die was hardened. After hardening, the 1.250 in. radius was ground and polished along with the throat radius to the necessary measurement for drawing the size desired.

After grinding the 5-in. radius D, the die was cut in half by a high-speed water wheel, and the surfaces E were ground to the proper size to accomodate the section B in Fig. 9. The die section shown in Fig. 9 was machined from a bar of high speed steel long enough to provide five pieces for replacement purposes. After these sections were machined, hardened, and filed to the shape shown by the three views in Fig. 9 the die was ready for assembling, as the top die (Fig. 10) used in the previous drawing attempts was still available. In Fig. 11, is shown a view of the assembled die.

For break-down, no difficulty was experienced after filing down the projection from the break-down die first used. After drilling and tapping a die frame for two screws to be used in holding the bottom die from spreading, finish-drawing was started and all dimensions were within the desired limits with the shape having the desired sharp corners and entirely free from scratches. In drawing 303 20-ft. bars, the section forming the keyway was replaced three times and only one bar of steel was lost due to scratches.

Only 20 hr. were used in breaking down and finish-drawing the shapes, and 24 hr. were required in designing and building the dies used. In the construction of the solid break-down die and the top sectional die originally used and which also were used for the final set-up, 64 hr. were consumed. This made a total of 108 hr. necessary to complete all dies successfully used and for drawing the 303 bars. But, there were 83 hr. spent in making and experimenting with the dies which proved unsatisfactory. A grand total of 191 hr., leaving 83 non-productive hours to be absorbed by the cold drawing department. Not a very profitable showing, considering the small order of only 303 bars of steel. Add on top of that the cost of the steel used in the discarded dies and the cost of nine bars of steel ruined by experimenting—this steel had to be melted, rolled, annealed, sand-blasted, pickled, coated, broken-down, again annealed, pickled and coated, which all takes time and costs money. Now, multiply this to a lesser or greater degree by 52 weeks in the year, and the engineering set-up suggested in the issue of Aug. 3 appears more than ever to be desired by these shops that do not have such an arrangement.

Ed. Note:—Next week the author continues with a description of a new type of break-down die, and includes data on coatings for cold drawing and other elements in the preparation of steel for drawing.

FEDERAL GOVERNMENT AWARDS

Government Steel Orders $4,968,686

WASHINGTON — Government contracts for iron and steel products as reported by the Labor Department's Public Contracts Division for the week ended Aug. 19 amounted to $4,968,686. For the same period contracts totaling $216,773 for nonferrous metals and alloys, and $1,080,794 for machinery were reported. Companies receiving the awards, the government agency placing the order, the products ordered and the amounts involved follow:

o o o

Iron and Steel Products

Ladish Drop Forge Co., Cudahy, Wis., Navy S & A, forgings, rough machined	$15,912.00
Rust Furnace Co., Pittsburgh, Navy S & A, furnace, stress	68,074.00
U. S. Pipe & Foundry Co., Birmingham, TVA, cast iron pipe and fittings	14,672.54
National Cast Iron Pipe Division, James B. Clow & Sons, Birmingham, WPA, water pipe, cast iron	16,558.73
Thos. Gregory Galvanizing Works, Maspeth, N. Y., Navy S & A, steel, bar	9,480.00
Central Iron & Steel Co., Harrisburg, Navy S & A, steel, plates	488,610.00
Worth Steel Co., Claymont, Del., Navy S & A, steel plates	Indefinite
Blaw-Knox Co., Pittsburgh, Navy S & A, kingposts	11,350.00
Thos. Gregory Galvanizing Works, Maspeth, N. Y., Navy S & A, steel, plates, sheet and strip	58,303.00
Alan Wood Steel Co., Conshohocken, Pa., Navy S & A, steel, plates	16,880.56
Superior Steel Corp., Carnegie, Pa., War, Ordnance, steel, strip	37,054.00
Hardie-Tynes Mfg. Co., and Koppers Co., Bartlett-Hayward Division, Birmingham and Baltimore, Interior, ring-follower gates	548,400.00
Bethlehem Steel Co., Alameda, Cal., Navy Purchasing Office, structural steel	25,500.00
Columbia Steel Co., Seattle, Wash., Worcester, Mass., Puget Sound Navy Yard, cable	27,752.60
Moltrup Steel Products Co., Beaver Falls, Pa., Treasury, engraving plates	18,619.44
A. N. Eaton Metal Products, Omaha, Neb., Agriculture, grain bins	80,000.00
Martin Steel Products Corp., Mansfield, Tiffin, Ohio. Agriculture, grain bins	626,200.00
Columbian Steel Tank Co., Kansas City, Mo., Agriculture, grain bins	299,625.00
Butler Mfg. Co., Kansas City, Mo., and Galesburg, Ill., Agriculture, grain bins	2,303,975.00
The Sioux Steel Co., Sioux Falls, S. D., Agriculture, grain bins	133,370.00
Edwards Mfg. Co., Cincinnati, Agriculture, grain bins	168,350.00

Non-Ferrous Metals and Alloys

Revere Copper & Brass, Inc., Baltimore, Navy S & A, tubing, copper, seamless	$15,845.53
Scovill Mfg. Co., Philadelphia, Waterbury, Conn., Treasury, blanks for nickel pieces	51,500.00
International Nickel Co., Inc., New York City, Navy S & A, nickel, remelting	13,440.37
International Nickel Co., Inc., New York City, Navy S & A, forgings, nickel-copper-alloy	92,208.00
Storms Drop Forging Co., Springfield, Mass., Navy S & A, forgings, nickel-copper-alloy	13,955.00
American-LaFrance-Foamite Corp., Elmira, N. Y., Navy S & A, extinguishers, fire	29,825.00

Machinery

Jones & Lamson Machine Co., Springfield, Vt., Navy S & A, lathes, turret	$20,387.00
The Carborundum Co., Niagara Falls, N. Y., Navy S & A, wheels, abrasive	35,000.00
Brown & Sharpe Mfg. Co., Providence, R. I., Navy S & A, machines, hand screw slide feed	26,915.00
Ferracute Machine Co., Bridgeton, N. J., War, Ordnance, vertical press and straight line machine	22,215.00
American Tool Works Co., Cincinnati, War, Ordnance, engine lathe	10,807.00
Monarch Machine Tool Co., Sidney, Ohio, War, Ordnance, engine lathes	17,421.70
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, War, Ordnance, milling machines	18,830.55
Rockford Machine Tool Co., Rockford, Ill., Navy S & A, shapers, hydraulic	13,100.00
Reed-Prentice Corp., Worcester, Mass., Navy S & A, lathes, engine	22,580.50
Brown & Sharpe Mfg. Co., Providence, R. I., Navy S & A, machines, milling	22,268.00
Kearney & Trecker Corp., Milwaukee, Navy S & A, machine, milling	12,058.45
Warner & Swasey Co., Cleveland, War, Ordnance, lathes, turret	24,470.00
Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn., War, Ordnance, shapers	20,548.00
Warner & Swasey Co., Cleveland, War, Ordnance, turret lathes	105,267.00
E. W. Bliss Co., Brooklyn, N. Y., War, Ordnance, vertical presses	14,925.00
Kearney & Trecker Corp., Milwaukee, War, Ordnance, milling machines	12,540.48
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati, War, Ordnance, milling machines	10,087.88
Chas. F. Elmes Eng. Works, Chicago, War, Ordnance, bending brake	14,500.00
Federal Machinery Sales Co., Chicago, War, Ordnance, boring mills	35,650.00
Pratt & Whitney Division Niles-Bement-Pond Co., Hartford, Conn., War, Ordnance, machine, jig boring	13,573.00
Bay City Shovels, Inc., Bay City, Mich., Farm Security, power shovel	16,275.00
Bay City Shovels, Inc., Bay City, Mich., Procurement, power shovels	16,875.00
Harnischfeger Corp., Milwaukee, Farm Security, power shovels	23,102.00
Speeder Machinery Corp., Cedar Rapids, Iowa, Farm Security, power shovel	16,281.00
Gardner-Denver Co., Quincy, Ill., Farm Security, pile drivers	13,584.60
Ingersoll-Rand Co., Athens, Pa., and Phillipsburg, N. J., Farm Security, pneumatic diggers	11,092.60
The General Excavator Co., Marion, Ohio, Procurement, power shovels	31,736.00
Nash Engineering Co., S. Norwalk, Conn., Schenectady, N. Y., TVA, centrifugal gas vacuum pumps	13,752.00
Caterpillar Tractor Co., Peoria, Ill., Procurement, terracer	12,007.00
Huber Mfg. Co., Marion, Ohio, Farm Security, rollers	16,536.00
Galion Iron Works & Mfg. Co., Galion, Ohio, Farm Security, road roller	17,772.00
Caterpillar Tractor Co., Peoria, Ill., War, Engineer, tractors with bulldozer	13,888.00
Buffalo Springfield Roller Co., Springfield, Ohio, WPA, rollers	10,925.00
McKiernan-Terry Corp., Harrison, N. J., Navy S & A, airplane crane	126,860.00
Foote Bros. Gear & Machine Corp., Chicago, TVA, intake gate hoist	12,269.00
The Alliance Machine Co., Alliance, Ohio, TVA, crane	83,789.00
Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., War, Ordnance, cartridge loading machine	37,125.00
Research Corp., New York City, TVA, precipitator equipment	57,770.00
The Oilgear Co., Milwaukee, Phila. Navy Yard, pumps and motors, hydraulic	18,661.00
E. W. Bliss Co., Brooklyn, N. Y., War, CWS, automatic manufacturing aids	25,100.00

New Air Bases To Cost $30,000,000

WASHINGTON—The Navy Department has awarded the architectural engineering contract for the construction of air bases authorized at the last session of Congress to Albert Kahn, Inc., Detroit. The department would not disclose the amount involved in the contract but Congress authorized $53,800,000 which amount will be spread over a three-year period for the construction of the bases. Not more than $19,450,000 will be expended during the current fiscal year.

Total Cost Includes Machinery

The total construction job, expected to cost approximately $30,000,000, will include 400 buildings, comprising barracks, hangars, and repair stations. The department has declined to estimate the amounts to be spent for machinery which is expected to include honing equipment for repairing cylinder barrels, equipment for maintaining armament, propellers, engines, aircraft accessories, landing gear, struts, aircraft fuselage and wing structures.

The law authorizing the additional air bases empowers the Navy Department to contract for the work under terms at variance with the usual lowest bidder procedure primarily because of the nature of the work and its location. The bases will be constructed at Kaneohe Bay, T. H.; at Midway Island, Wake Island, Guam, Johnston and Palmyra Islands in the mid-Pacific area; Kodiak and Sitka in the Alaskan area; and San Juan, P. R.

THIS WEEK ON THE ASSEMBLY LINE

By W. F. SHERMAN
Detroit Editor

. . . Greater use of sheet steel predicted for 1940 by Plymouth . . . Production starts upward spurt with assemblies reaching 17,465 last week . . . New cars announced by Chrysler follow expenditure of $12,000,000 . . . Pontiac and Buick show cars for 1940 . . . Bigger steel releases await heavier production.

DETROIT — Designs for 1940 model automobiles indicate a sharp boost in the amount of metal required during the forthcoming year by the steel industry's No. 1 consumer—the automotive industry. More steel than ever will be needed for construction of 1940 cars, it is apparent, even without the expected upturn in new car business this fall.

Changes in the over-all dimensions of automobiles and the varied designs of auto bodies, front ends and sheet metal are such as to sharply increase the 3,000,000 tons of steel consumed in the building of 1939 cars in the season just passed.

Credit must go to a Plymouth source for doing some calculating to show what the next year holds forth. Approximately 4,250,000 sq. ft. more sheet steel than last year will be required to build the first 250,000 new Plymouth cars alone, factory engineers confirm. The increase in size of the Plymouth and other 1940 cars for greater comfort and passenger room promises a wholesale increase in steel tonnage.

As much as 17 sq. ft. more sheet metal will be used on the new Plymouth sedan. Outside measurements of these bigger bodies reveal important gains ranging from several inches (lineal) in some cases to as much as 12 cu. ft. in additional body volume on the Plymouth. Also evident is the fact that longer wheelbases will add to the amount of material used. The location of rear fenders farther toward the back of the new cars, particularly on the Plymouth, allows full width rear doors without cutaway sections around fender contours. Besides the added steel used for bigger bodies and for larger, more flowing fenders, additional steel is required for longer frames and other chassis changes in the new designs.

Officials declined to estimate new steel requirements for the final quarter of 1939, pointing out that this total depends upon the public's reception of 1940 models when they are introduced. There is a general anticipation of greater volume of car sales, however.

100,000 Cars a Week

Automobile production has already begun an upward climb to an estimated volume of 100,000 cars a week, which the industry is expected to attain late in September. Steady movement of final assembly lines in the majority of automobile plants brought about a spurt in automobile production last week. Volume was 17,465, compared with 12,955 cars and trucks in the United States and Canada in the previous week and 18,700 in the corresponding week of last year, according to Ward's Automotive Reports.

Chrysler showed the biggest volume increase when assemblies jumped to 5900 units, compared with 2450 the previous week. Plymouth, first unit in the industry to strike a full stride, accounted for 2800 cars. Ford production amounted to only 450 units and Lincolyn-Zephyr remained closed. Likewise, Chevrolet continued its model change-over, with considerable retooling still to be done, so resumption of production in this plant is not expected for some time. GMC volume was up to 2600, against 1215 the previous week.

1940 plans for several of the automotive companies were revealed during the past week.

Chrysler showed its complete line of cars—Plymouth, Dodge, DeSoto and Chrysler—during the week and, to quote K. T. Keller, president, "These are not new models; they are altogether different automobiles."

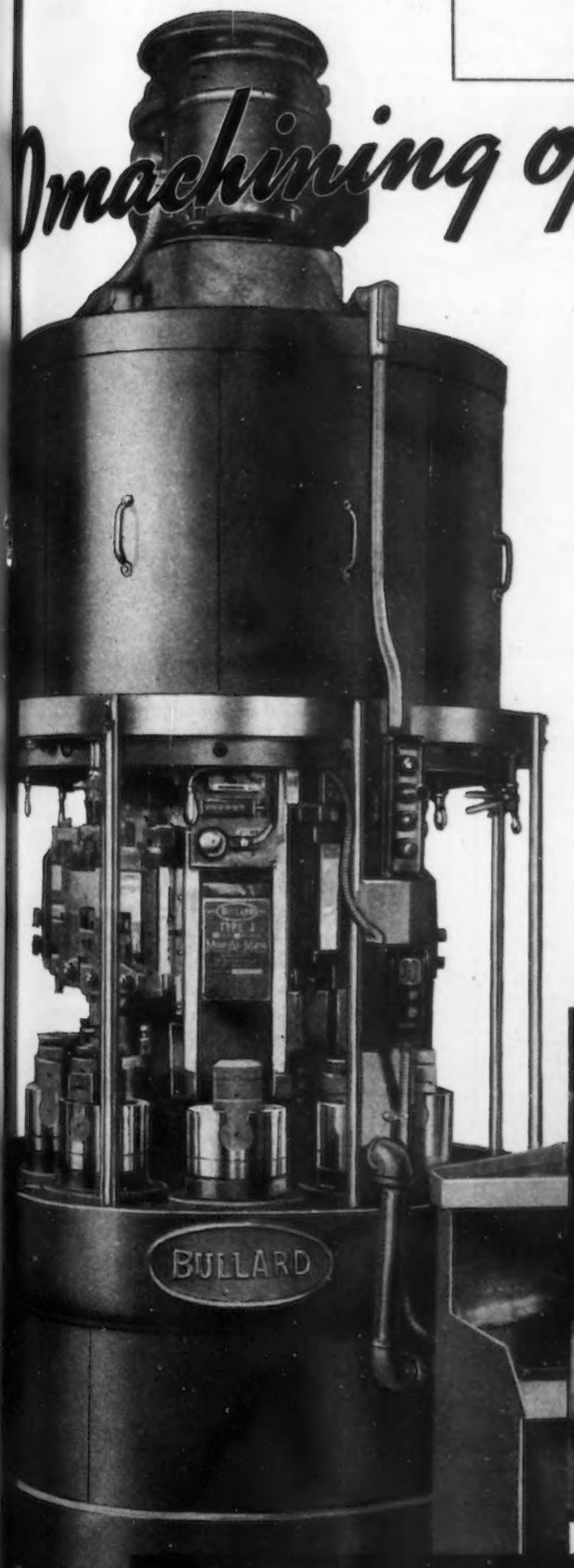
An investment of upwards of $12,000,000 in new tools, dies, jigs and fixtures was made to produce the 1940

THE lowest priced full sized automobile in the world offered by Willys for 1940. The car in this picture is a deluxe coupe. The standard line is very similar, with less chrome trim.

20 MACHINING OPERATIONS...COUNT 'EM

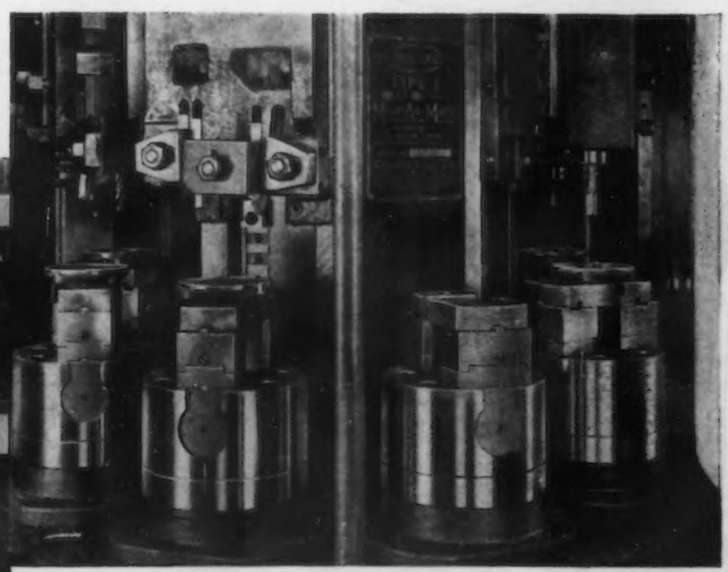
Rough face A surface	Finish face L surface
Rough face B surface	Finish turn C surface
Rough face K surface	Rough face D surface
Bore H hole	Finish face A surface
Rough turn C surface	Finish face B surface
Rough face L surface	Finish face K surface
Chamfer F surface	Groove J surface
Drill F hole	Groove G surface
True bore H hole	Finish face D surface
True bore F hole	Ream F surface

20 machining operations in 16 secs.



These are the facts on a motor cover job. There are 20 distinct operations from rough casting to finished cover. A "J-7" Mult-Au-Matic handles the job in exactly 16 seconds (plus a few seconds for indexing). Several of the operations involve removing up to 3/32" of stock.

Only Bullard Mult-Au-Matics offer the advantages of independent speeds, independent feeds and simultaneous operation, which makes such time possible. Most Multi-Au-Matics are available with 6 or 8 stations and arranged for single or double indexing as desired. If you are serious about cost reduction, ask for a study of your job by the Mult-Au-Matic Method.



Start and finish of the job described here.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

models, Mr. Keller revealed. This, he said, does not include engineering expense, nor does it include improved manufacturing equipment and plant rearrangement. Details of the new cars are being reserved for announcement in September but two major points, increases in wheelbase and engine horsepower on Plymouth and Dodge, have already been revealed.

Buick has made an outlay of more than $8,000,000 for plant changes, new machinery, retooling and the like and has already introduced at a press preview the highly streamlined Torpedo Series "50" and "70." Harlow H. Curtice, president and general manager, declared at the unveiling of the new cars that Buick has an initial stake of $40,000,000 in the 1940 automobile market. This represents commitments for production materials, supplies and wages for the next 60 days. The management is aiming at a 1940 model output of 240,000 units, domestic, representing an increase of 20 per cent over 1939. Already scheduled are 100,000 Buick cars for this fall, the biggest fall output in Buick's history.

Mr. Curtice made an interesting observation on expenditures. "On the basis of our manufacturing index," he said, "it is estimated that Buick disbursements for all purposes during the 1940 model season will approximate $200,000,000, which may be considered typical of the automobile industry's contribution to the national economy."

Although Pontiac's exhibition of its 1940 cars was held last week, it was observed that wooden models were substituted for the real thing through most of the line. Of course, the casual observer didn't readily notice the difference. The cars were full size, fully trimmed and upholstered on the inside and completely finished. Lack of complete body dies and tooling is blamed.

Four new lines of cars, including 17 models in all, are to be offered. H. J. Klingler, general manager, unveiled the four new cars, including a new low priced six and a new eight. An increase of 20 per cent, up to 175,000 cars, is predicted for 1940. The Pontiac has a new and longer final assembly line in operation. Production was started Aug. 21 with 100 cars, reached 250 by mid-week and was up to 350 per day by the end of the week. A total of 3000 cars will be turned out by the end of August. Scheduled are 15,500 cars in September, when a daily production of 750 cars, five days a week, will be reached.

Only definite hold-up in the industry's plans is an occurrence last week in Indiana. A strike at the Muncie plant of Warner Gear, in progress quietly for several weeks, finally halted delivery of transmissions to Studebaker and threw 6000 employees out of work at the South Bend factory. Chrysler units, particularly DeSoto and the Chrysler division, it is understood, may suffer if the strike is prolonged.

The Hi-Test safety plate glass which was given its public announcement a few weeks ago, will not go into 1940 automobile bodies without having had a pretty thorough test. In this connection it is interesting to know that Chrysler engineers, in cooperation with the Pittsburgh Plate Glass Co., have experimented with the new plastic for safety glass since Feb., 1936, more than three and a half years ago. Since Jan. 1, 1937, Pittsburgh Plate Glass has shipped to Chrysler Corp. 3,661,947 pieces of this new glass, aggregating 7,404,804 sq. ft.

Also, Studebaker, and even Fisher Body itself, made use of this Hi-Test safety glass through most of the first half of 1939. Of course, the public, "has to be sold" and the advantages of the Hi-Test plate glass (which is truly a safety glass even at zero temperatures) would not have been appreciated until someone came along and made the Hi-Test glass a talking point and a sales feature.

Delivery of steel for 1940 models still has not attained the heavy tonnages that are anticipated, and the reasons are two-fold. The fact that Pontiac showed wood models indicates one of the reasons: Production is underway on some models but tooling is not entirely complete, and for this the CIO tool and die strike is to blame. The other important reason is that the two major consumers, Ford and Chevrolet, are not yet ready to make heavy releases of steel. Ford cars are not expected to be shown until some time near the date of the National Automobile Show. Announcement of Chevrolets is very uncertain. Originally a preview was scheduled for September but late last week it was learned that cars would not be available until some indefinite date, probably near the end of next month.

The above is not an indication that steel releases are unusually low—but in some quarters there were questions because maximum tonnages were not being released.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

DO YOU REALIZE WHAT IT WOULD HAVE COST TH' COMPANY IF WE HADN'T CAUGHT YOUR MISTAKE IN THAT BLUE PRINT?
LOOK AT IT! AND ONE OF TH' DUMBEST MEN IN TH' SHOP CAUGHT TH' MISTAKE RIGHT AWAY! WHO MADE THAT DRAWING, YOUR OFFICE JANITOR?
LOOK AT 'EM RUBBIN' IT IN! YOU'D THINK GUYS AS HIGH UP AS THEY ARE WOULD TRY TO WORK IN HARMONY
CONTRARY TO ALL OPINION, IT AIN'T HARMONY THAT MAKES SUCCESSFUL COMPANIES -- IT'S WORKIN' AGIN EACH OTHER.... I KNOW OF A BIG COMPANY THAT HIRES BOSSES THAT HATE EACH OTHER AND WORK THEIR HEADS OFF TRYIN' TO SHOW EACH OTHER UP!
8-25
J.R.WILLIAMS
T. M. REG. U. S. PAT. OFF.
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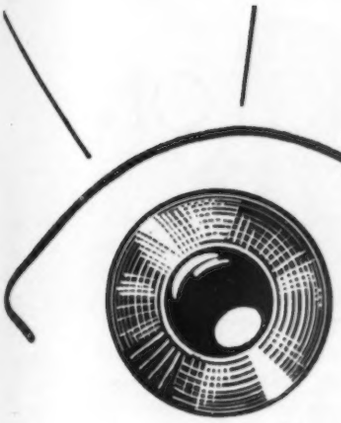
THE FATHEAD DEPARTMENT



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ASK AT CARBOLOY BOOTH 5300 FOR A LIST OF MACHINE TOOL EXHIBITORS USING CARBOLOY TOOLS ON THEIR MACHINE DEMONSTRATIONS

THIS WEEK IN WASHINGTON

. . . Government prepares to cushion possible war shock . . . War Resources Board weighs control of prices . . . U. S. plans trade agreement with Argentina . . . Secretary Hopkins organizes new industrial economic division.

o o o

By L. W. MOFFETT
The Iron Age

o o o

WASHINGTON—Ordinary domestic problems were relegated to the background this week as plans were made to cushion the effects of a possible European emergency. Meetings of the War Resources Board continued, Treasury Department and other government representatives were considering additional measures for protecting domestic financial markets, the Navy Department discussed tentative plans for putting navy yards on a 24-hr. basis, and government orders under the armament program were lending increased impetus to steel production.

The War Resources Board, headed by Edward R. Stettinius, Jr., board chairman of the United States Steel Corp., was understood to have under consideration methods for permitting price fixing under the industrial mobilization plan and of assuring efficient operation of industry in war production—recommendations which would require Congressional sanction before being put into operation. For the present, the board, which is expected to become the War Resources Administration cited in the War Department's industrial mobilization plan, is acting in an advisory capacity but in the event of war it would become an executive agency and be placed directly under the control of the Presi-

Also mentioned as figuring in the discussions was the problem of coordinating transportation, labor and electric power facilities. Authority for final decisions would rest with the chairman of the board but on questions involving price fixing the chairman would be governed by the conclusions of a price control committee. The board will continue to study plans and background material compiled by the Army and Navy Munitions Board.

Treasury Department officials, following the policy of attempting to keep the markets open with business as usual despite possible European developments, conferred with representatives of a score of other government departments and laid the groundwork for precautionary measures. Primarily, the Treasury is concerned with regulating foreign exchange and government financing and could minimize fluctuations in the value of the dollar in terms of other currencies in order to make continued foreign trade of American business interests through the $2,000,000,000 stabilization fund. The department also faces the problem of borrowing more than $2,000,000,000 to pay government operating expenses in excess of tax revenues and wants to forestall if possible any complications in money markets resulting from war troubles.

John W. Hanes, Acting Secretary of the Treasury, told newsmen that detailed plans for meeting any economic emergency had been substantially completed following a series of conferences last spring when President Roosevelt asked Secretary Morgenthau to direct fiscal officials to formulate precautionary measures. Morgenthau at that time announced that the interdepartmental fiscal committee had finished the job of preparing the country in a financial way for any European emergency.

The Navy Department was considering the possibility of putting all navy yards on a 24-hr. operating basis to speed its shipbuilding program. Employees working around the clock could complete construction of two battleships—the Washington and North Carolina—so that these ships could be commissioned next year. Otherwise, the earliest date for their completion has been fixed for the fall of 1941. Other battleships, including the Iowa, New Jersey, Massachusetts, Alabama, Indiana and South Dakota are in various stages of completion although it has been estimated that their construction time could be reduced by one-half if the longer work hours were adopted.

Since the beginning of the naval expansion program in March, 1933, there have been completed 106 new naval vessels, all of which are now in commission, including four aircraft carriers, eight heavy and nine light cruisers, 27 destroyers and 21 submarines. Ships under construction include two aircraft carriers, 38 destroyers, 20 submarines, six light cruisers, eight torpedo boats, four submarine chasers and several auxiliaries.

$6,000,000 for Machine Tools

Both War and Navy Departments have been speeding purchases of munitions, machinery and shop equipment recently and the Army has taken steps to hasten work in the six government-owned arsenals where a $6,000,000 Congressional appropriation is being used to replace obsolete machine tools as a part of a $16,000,000 modernization program. Double shifts are working in several of these plants which turn out all of the guns, coast and field artillery, machine-guns, tanks and rifles manufactured by the government.

Heavy guns and breech mechanisms are made at the Watervliet, N. Y., arsenal. The Army's new semi-automatic rifle is being turned out at the

Guards To Prevent Sabotage In Mills

WASHINGTON—In line with the government's policy of keeping pace with European developments, indications at the War Department this week are that it is prepared to combat sabotage by posting guards in addition to regular government inspectors at aircraft plants, munition works, and other vulnerable industrial centers. Some officials take the view that there is more reason to take precautionary measures against possible sabotage than during the World War.

With a spy hunting force probably larger and more efficient than at any other time in its peace-time history, the government is depending upon the combined activities of the Justice Department's Federal Bureau of Investigation, Army and Navy intelligence officers, the State Department, Treasury Department agents and the Labor Department's immigration officers.

How can I cut down rejects?

"TRY G-E LIGHT-CONDITIONING!"

says Belmont Radio Corporation - and proves it with increased production

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We can assure you that this modern lighting system has aided us appreciably in maintaining our increased production schedule. This has been accomplished with a decrease in rejects per unit production.

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The Belmont Radio people were skeptical . . . . until they had a trial fixture demonstration. Now, with 55 footcandles of light on assembly work, they report a definite decrease in rejects per unit production.

How is the lighting in *your* plant? Have employees enough light so that no unnecessary time is lost . . . .so that no mistakes are made that could be avoided through better seeing conditions?

Your local electric company will measure your lighting free of charge. But whatever your problem, you'll get more light for your money if you use G-E MAZDA lamps. They're more efficient than ever this year —and they stay brighter longer!

• • •

Belmont Radio Corporation, 1257 Fullerton Avenue, Chicago, finds production up, rejects down after light-conditioning. Employees now have 55 footcandles of light on assembly work.

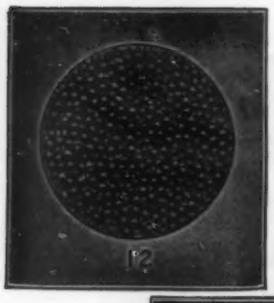
MORE LIGHT FOR YOUR MONEY

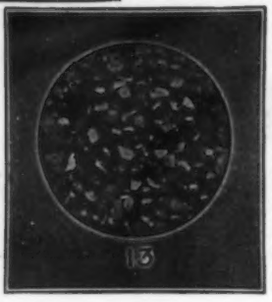
because

THEY STAY BRIGHTER LONGER

G-E MAZDA LAMPS

GENERAL ELECTRIC





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Springfield, Mass., arsenal. At the Boston arsenal, seacoast defense guns and anti-aircraft artillery are manufactured; tanks and gun mounts are made at the Rock Island, Ill., arsenal; and the Picatinny, N. J., and Frankford, Pa., arsenals specialize in the loading of shells.

At the Washington Navy Yard, already operating on a 24-hr. basis, guns of all calibres, particularly the 16 in. guns to be mounted on eight battleships, are under construction. Five of the battleships are being built in government yards, three in private yards.

Secretary Hopkins Organizes Industrial Economics Bureau

WASHINGTON — Harry L. Hopkins, who as Secretary of Commerce since December, 1938, still aims to mold his slumbering department into a potent force in the field of government-business relations, stole a march on the expectant Federal Trade Commission last week and established a division of industrial economics. Congress appropriated an extra $160,000 to the Commerce Department last session and Mr. Hopkins lost no time in naming his "spark-plug" crew and in establishing the new division.

Hopkins, who considers his department to be the federal agency concerned with everything that concerns business—particularly its relationship with the government—characterized the move as "a forward step in finding practical solutions to our problems and in promoting recovery." The new division will report directly to the secretary, will be in "constant consultation with representatives of business and other government agencies," and has been instructed not merely to study but "to attack major problems on many fronts."

Wants Jobs Increased

Although it was not specifically disclosed in what manner the new set-up would attain that elusive condition called "recovery," Mr. Hopkins said he wanted his department "to proceed vigorously with the view of increasing employment and balancing our economic structure."

When Congress appropriated the $160,000, there were definite indications that the designation of a staff of trouble-shooting experts would be a step in the direction of establishing a bureau of industrial economics although it was not generally expected that such a unit would be set up without further Congressional authority. However, creation of the division was considered of little importance, Commerce Department press statements to the contrary notwithstanding.

The step does represent a setback for the Federal Trade Commission which had made no secret of its desire to take such a bureau under its wing. The FTC actually was given funds back in 1919 to collect business statistics as a method of cushioning severe changes in the business cycle but litigation halted its efforts and Congress subsequently cut off the funds despite the fact the courts upheld the commission's authority to compel business units to submit reports to the government.

Richberg An Advocate

Donald Richberg, former NRA administrator and White House adviser, has long been out in front as an advocate of such a bureau but has consistently opposed the idea of establishing it under a regulatory arm of the government, and President Roosevelt has urged a thorough study of the idea as a method of bringing production into line with consumption. The Commerce Department and the Federal Trade Commission have been vying for the bureau for several years.

The following will be members of the new division:

V. Lewis Bassie, former Federal Reserve Board economist.

Robert L. Davison, head of Housing Research Division of J. B. Pierce Foundation.

James Hughes, former assistant to the president of the Standard Gas Equipment Co. of Baltimore.

Robinson Newcomb, former Commerce Department official.

Roderick Riley, formerly of the Consumers Advisory Board staff.

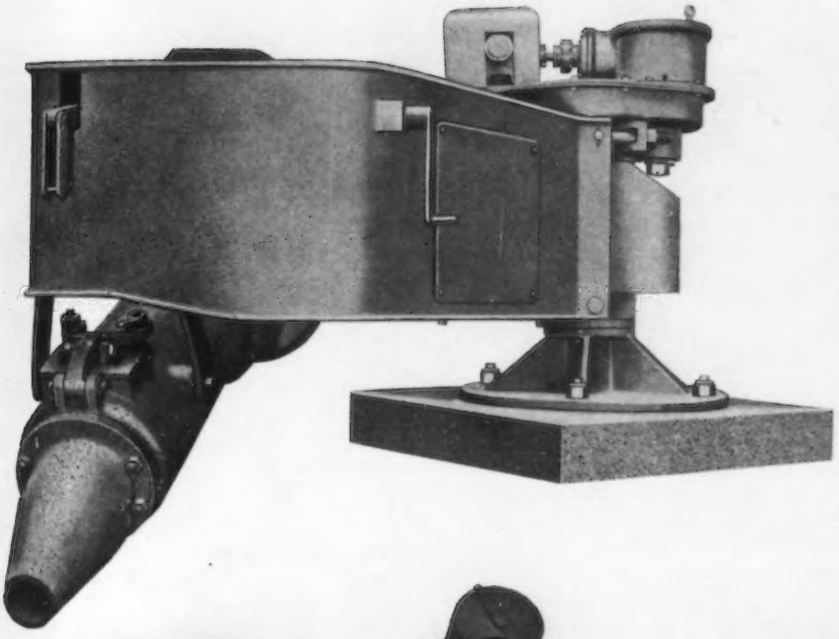
Paul Truitt, of Sears, Roebuck & Co.

Reinforcing Steel Meeting

THE semi-annual meeting of the Concrete Reinforcing Steel Institute will be held at the Hotel Hershey, Hershey, Pa., Sept. 14 to 16.

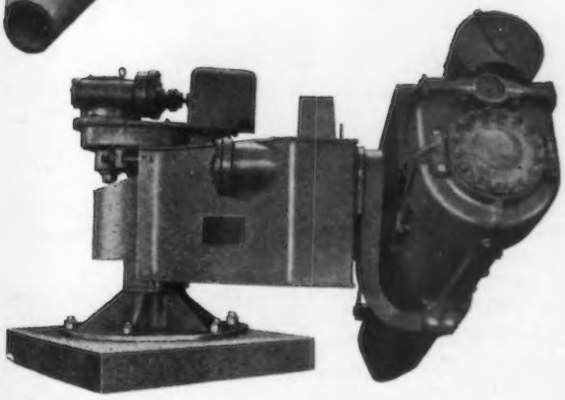
THE BAILEY
ELECTRIC PLUNGER CLAY GUN

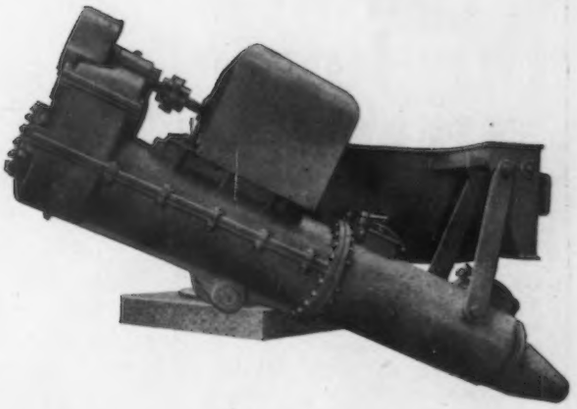
FOR BLAST FURNACES



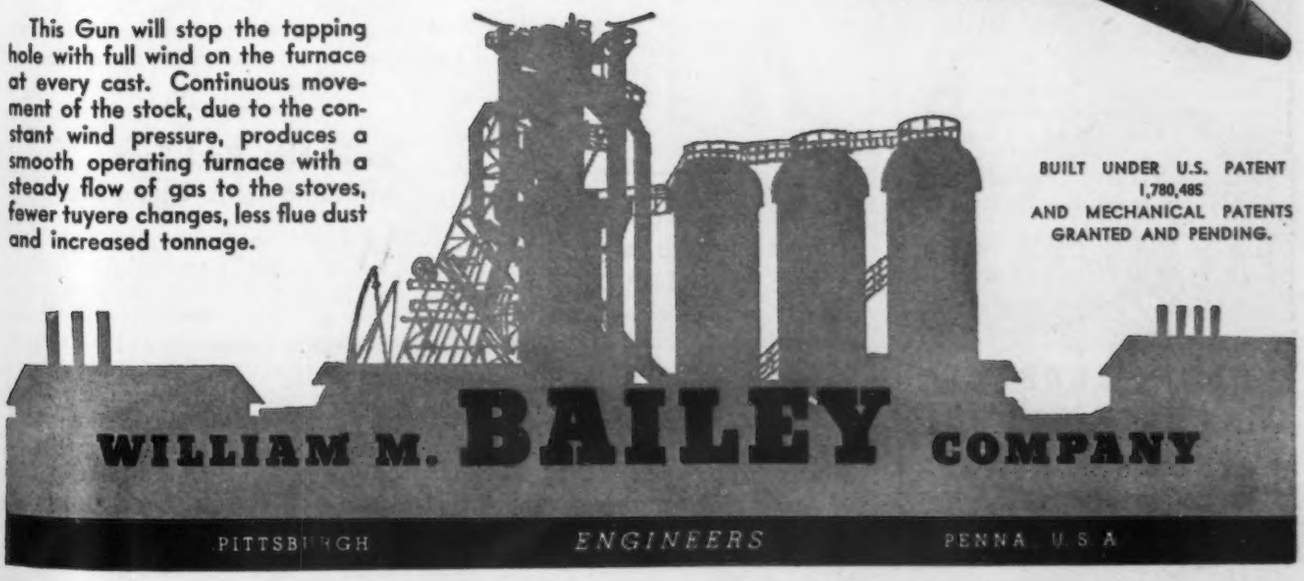
THE BAILEY COMPANY marketed the original electrically operated Clay Gun, with Independent Pedestal, in 1928, and are now offering an improved design of electric plunger type gun. The independent pedestal guarantees the movement of the gun in exactly the same path so that the nose of the gun always enters tapping hole. The plunger or piston is operated by an internal screw motor driven. A long hole or long plug is absolutely certain, due to the quantity of clay and to the high pressure at the nozzle, which produces a denser, harder plug and makes for sureness and safety in stopping the tapping hole. Time required: 30 to 45 seconds.

Weight: 22,000 Lbs.
Clay Capacity: 9.6 Cu. Ft.





This Gun will stop the tapping hole with full wind on the furnace at every cast. Continuous movement of the stock, due to the constant wind pressure, produces a smooth operating furnace with a steady flow of gas to the stoves, fewer tuyere changes, less flue dust and increased tonnage.



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U.S. Plans Reciprocal Trade Agreement with Argentina

WASHINGTON—A proposed reciprocal trade agreement with Argentina which, if approved, will be the first comprehensive commercial arrangement between the two countries since 1855, is the subject of public hearings called for Oct. 16.

Although United States exports to Argentina since 1924 have exceeded imports from that country by $486,900,000, the State Department feels the agreement will enable this country to maintain its competitive position in a market of great importance, and reports that United States trade with Argentina has suffered in recent years for lack of a trade agreement.

Among the American products sold to Argentina in 1938, machinery and vehicles comprised a large proportion of the total, according to Commerce Department figures. Exports in this category, valued at $59,121,000, are slightly below their value for 1937, represent approximately two-thirds of this country's exports to Argentina. Exports of aircraft were up 46 per cent and those of agricultural machinery and tractors were 24 per cent larger than in 1937, while sales of automobiles and parts declined only moderately from $25,420,000 in 1937 to $24,138,000 in 1938.

Among the principal metal items outside the machinery field exported to Argentina in 1938, were 21,847 tons of wire and manufactures, and 6221 tons of tubular products and fittings. This compared with 1937 export figures of 10,643 tons of sheets, 47,174 tons of tinplate, 16,231 tons of wire and manufactures, and 9578 tons of tubular products and fittings.

Out of $59,121,000 worth of machinery and vehicles sold to Argentina in 1938, automobiles, parts and accessories represented a value of $24,138,000; agricultural machinery and implements, $14,234,000; and aircraft and parts, $6,187,000. Exports of passenger automobiles increased from $5,679,000 in 1936 to $10,383,000 in 1937 and finally dropped slightly to $10,109,000 in 1938.

Tariff concessions on Argentina imports are being considered for certain types of foodstuffs, including canned meats, fresh fruits and vegetables, tanning extracts, vegetable oils, raw wool, hides and furs.

Navy Buys Lathes, Electric Furnaces

WASHINGTON—The Navy Department's Supplies and Accounts last week announced award of contracts to these companies: Gisholt Machine Co., Madison, Wis., turret lathe, $6,452; the Sidney (Ohio) Machine Tool Co., engine lathes, $6,859; Henry Prentis & Co., New York City, turret lathes, $30,863; Kuhlman Electric Co., Detroit Electric Furnace Division, Bay City, Mich.; electric arc rocking furnaces, $25,471; Waukesha (Wis.) Motor Co., engine, $7,099.

CIO Mine Union Wins Election in Alabama

WASHINGTON—The National Labor Relations Board has announced certification of Lipscomb Red Ore Local Union No. 103 of the International Union of Mine, Mill and Smelter Workers, affiliated with CIO, as the sole collective bargaining agency selected by a majority of the workers of the Woodward Iron Co., Woodward, Ala., following a secret ballot election held July 29. The election resulted in a count of 454 votes for the CIO local to 81 votes for the Red Ore Miners' Union No. 21971, affiliated with the AFL, with four votes for neither.

The NLRB also has called a collective bargaining election to permit employees of Minneapolis-Moline Power Implement Co., Hopkins, Minn., to vote for the AFL's International Association of Machinists, for the CIO's United Electrical, Radio and Machine Workers of America, or for neither.

Soviet-Nazi Pact Seen Affecting U. S. Manganese

WASHINGTON—The new Soviet-Nazi trade and non-aggression pacts "give further emphasis to the need for speedy development of our own domestic resources of the strategic mineral manganese," J. Carson Adkerson, president of the American Manganese Producers Association, said here. "Russia is the major supplier of manganese to the United States. The new alinements in Europe indicate that larger shipments of Soviet manganese will go to Germany."

NICKEL CAST IRON FOR... STRENGTH ...IN HEAVY CASTINGS MADE BY AMERICAN SAW MILL MACHINERY CO.

For an ore sintering machine, American Saw Mill Machinery Co. cast this main drive gear with the following composition: T.C. 3.21, Si. 1.68, Ni. 1.29, and Mo. 0.46. 2" sections showed a tensile strength of 50,500 p. s. i.

This 12,500 lb. press head casting from the American Saw Mill Machinery Co. foundry is just out of the mold—hasn't been chipped or cleaned yet. It contains 1.25% Nickel and has a 55,590 p. s. i. tensile strength. Dense, uniform structure of this Nickel iron retains accurate dimensions despite high stresses and temperature changes.

Big castings, such as this 12-foot main drive gear or this 6-ton press head, are being produced of a Nickel alloyed cast iron possessing a minimum tensile strength of 50,000 p.s.i.

Such results are profitable—and practical through scientific use of Nickel and other alloying elements and by close control of all foundry operations.

These high strength shock and wear resisting Nickel cast irons are representative of the quality castings being produced by the American Saw Mill Machinery Co., Hackettstown, N. J. who also utilize a new molding procedure which guarantees extreme accuracy in the finished casting thereby avoiding excess weight.

Are you taking advantage of the strength of modern high test Nickel alloy cast iron in your equipment? Complete information will be furnished promptly without obligation. Please address:

THE INTERNATIONAL NICKEL COMPANY, INC., 67 WALL ST., NEW YORK, N. Y.

ICC Issues Wrought Iron Pipe Ruling

WASHINGTON—In an exhaustive decision announced last Wednesday, the Interstate Commerce Commission found justified all-rail and ocean-rail rates not in excess of 32.5 per cent of the first-class rates on wrought-iron pipe, couplings and fittings, in minimum carloads of 40,000-lb. to, from and within the Southwest. Generally speaking the new rates, effective Dec. 22, will increase those now prevailing.

On ocean-rail traffic the commission ordered that Aliquippa, Ambridge, Beaver Falls, Brackenridge, Butler, Economy, Elwood City, Etna, Morado, New Kensington, and Sharpsburg, Pa., shall be grouped with Pittsburgh and that Lorain, Ohio, shall be grouped with Cleveland.

On ocean traffic moving over Seatrain routes from the East to New Orleans the Commission prescribed rates not in excess of 5c. per 100-lb. over the maximum reasonable rates provided for the break-bulk ocean-rail movement.

On cast-iron pipe, in minimum carloads of 40,000-lb. the commission prescribed a maximum distance scale of rates which are equivalent to 120 per cent of the so-called Krupp scale, which applies to movements in the Southwest. This basis of rates will approximately maintain the present level of rates on cast-iron pipe. Provision also was made for grouping of origins in the South.

In fixing the 32.5 level of rates the commission conceded it had no right to prescribe as maximum reasonable rates primarily designed to meet the lower river barge rates but it did suggest a level of 27.5. It did so because it was stated that if rates on the full column 32.5 basis were established it is almost certain that the combined all-rail and ocean-rail routes would not handle as much as half of the movement from the Ohio and western Pennsylvania producing districts to the Southwest because of the competition with barges operating through Mississippi River gateways and posts on the intercoastal canal, particularly Houston, Tex.

The commission added that even if barge transportation were not an important factor point-to-point application of the 32.5 level would not meet the situation as to wrought pipe because of the severity of competition between ocean-rail and all-rail routes, particularly to Texas points.

STAMPED ... by PARISH

A handsomely streamlined top casing for a household stoker, stamped out of 1/16th" hot rolled steel. Measures 33 3/8th" in length, 25 3/8th" in width, and the depth at the highest point is 7 1/2". Beauty and efficiency from one sheet of steel.

With all the svelte lines of a Paris creation, this stamping is destined to please the eye of a lady. More important to industry perhaps, it favored the purse of our customer.

Specialists in stamping, grounded in metal characteristics, we can serve you well—with style, quality and low price.

Permit us to review your requirements. No obligation incurred.

PARISH PRESSED STEEL CO.
READING, PA.
PACIFIC COAST REPRESENTATIVE, F. Somers Peterson Co., 57 California St., San Francisco, Cal.

Steel Exports to Argentine From U. S. Rise in July

WASHINGTON—Imports of tin plate, sheets, pipe and wire into the Argentine increased sharply in July, 1939, compared with the preceding month and the corresponding month of 1938, according to a report by United States Trade Commissioner R. Horton Henry at Buenos Aires made public by the Department of Commerce. According to local trade sources, imports of these products amounted to 18,130 tons in July, 1939, compared with 12,350 tons in June, 1939, and 8871 tons in July, 1938. United States shipments to the Argentine in July included four tons of tin plate, 162 tons of sheets, 57 tons of pipe and 1340 tons of wire, or 8.6 per cent of the total imports of these products. As compared to the total shipment by the United States of 1563 tons,

Argentine imports of these products from Belgium amounted to 7827 tons; from England, 4948 tons; and from Germany, 2838 tons.

Grand Coulee Dam Contracts Awarded

WASHINGTON—The Bureau of Reclamation has awarded a $185,660 contract to the American Radiator & Sanitary Corp., Denver, for pipe, fittings and appurtenances for the emergency-gate air inlets and drum gate spillway at the Grand Coulee Dam in the state of Washington.

The Lynchburg Foundry Co., Lynchburg, Va., also was awarded a $15,213 contract for cast-iron pipe, control valves, manholes and drains for the gate chambers is the spillway section.

Procurement Division Behind FDR's Schedule

WASHINGTON—Despite President Roosevelt's order of last June consolidating all civilian Government buying in the hands of the Treasury Department's Procurement Division, the agency thus far only has been able to step up its purchases at the rate of $1,000,000 a month. This additional buying results from taking over the purchases by divisions of the Government now included under the Federal Works and Federal Security Agencies.

The Government buys a wide variety of products at the rate of $1,000,000,000 a year. Purchases made by the Army, Navy and Marine Corps account for about $550,000,000 worth, while civilian buying aggregates $450,000,000 a year. Of this $450,000,000 total, the Procurement Division previously handled purchases totaling $180,000,000. The $270,000,000 balance will eventually be routed through the division when it is equipped to take on the heavier load.

855 Planes Exported by U. S.

WASHINGTON—Indicating the demand growing out of the European situation, exports of aircraft during the seven months ended July of the current year rose to 855, valued at $36,217,591, compared with 507 valued at $24,578,081 in the corresponding period of 1938. Exports in July of the present year were 122 valued at $5,805,220 compared with 72 valued at $3,572,233 in July of last year.

Welding Society Plans Extensive Fall Meeting

A COMPREHENSIVE program comprising some 56 technical papers at 15 sessions, some simultaneous, has been planned for the 20th annual meeting of the American Welding Society to be held at the Stevens Hotel, Chicago, during the week of Oct. 23, coinciding with the National Metal Exposition.

The technical sessions will cover: Government construction work; production welding of light-gage material; welding in machinery construction; welding in equipment construction, and resistance welding (two sessions). Also, welded piping, pressure vessels and boilers; welding in structural and ship work; flame hardening and hard surfacing; cutting and welding in steel mills; railroad welding and miscellaneous applications. Two

FOR SHOCK LOADS
AT HIGH SPEEDS—
STEEL PICKS PENOLA!
● Steel men don't take chances on lubricants. They *can't!* Especially since the trend is toward faster rolling speeds and fewer passes by taking heavier drafts. That means greater bearing stresses and heavier roll neck pressures.
For complete protection under these conditions, a vast majority of steel mill operators in the U. S. and Canada specify Penola lubricants for all roller bearings, gear drives and pinions!
Penola manufactures and sells more steel mill lubricants than any other maker in the world. Let Penola's lubrication engineers help *you.* They're at your service!
PENOLA LUBRICANTS
Penola Inc., Pittsburgh, Pa.
(Formerly Pennsylvania Lubricating Company)
New York • Chicago • Detroit • St. Louis
LUBRICANTS FOR THE STEEL INDUSTRY
SINCE 1885

sessions will be devoted to fundamental research and one to industrial research, and there will be evening conferences on both types of research.

The society's annual banquet will be held on the evening of Oct. 26, and the annual business meeting, with election of officers, on the morning of Oct. 27. The latter will be followed by an inspection trip to Electro-Motive Corp. plant at La Grange, Ill.

"Hopr-Seal" Metal Box Used by Atlas Bolt & Screw

CLEVELAND — Atlas Bolt & Screw Co., Cleveland, has announced that it will hereafter pack in metal boxes its entire line of approximately 5000 kinds and sizes of bolts, nuts and kindred items. The containers, known as "Hopr-Seal" boxes, are the invention of J. W. Simmons, Cleveland Heights, Ohio, who has applied for patents. The Atlas company is one of the first licensees under the method of manufacture.

Made by a can company, the metal box has a hopper front and permits easy access to the contents regardless of the number of boxes stacked one on top of the other. The containers are made by taking a common run of mine stock can and squaring it up, the cost of the operation being low while the weight is small.

A corrugated sleeve is provided to protect the finish. Advantages claimed for the new can include savings on shelf space and investment; promotion of visible sales appeal; and appeal for the customer through ability to re-use the container when empty.

Brazil Cancels British Iron Ore Concession

LONDON—President Getulio Vargas of Brazil has issued an order canceling the concession in Brazil granted to the Itabira Iron Ore Co., a British concern. The concession was for the exploitation of ore and it is alleged there has been a breach of contract. The company was formed 28 years ago and owns 18,100 acres at Minas Geraes. These lands contain hematite ore reserves estimated at 5,000,000 tons.

Steel Pays $10,000,000 for Research During 1939

APPROXIMATELY $10,000,000 is being spent this year by the steel industry for research into methods of improving its products and manufacturing processes, and to develop new products. Total estimated expenditures for research this year is nearly half a million dollars more than was spent in 1938, and is 15 per cent more than the total of $8,700,000 which was spent for research in 1929. In 1937 steel companies spent $10,300,000 for research work, the largest sum on record.

Toledo Scale Combines Five Plants in One

TOLEDO—The Toledo Scale Co., Toledo, is centering its activities in a new plant on Telegraph Road at Laskey Road near the Ohio-Michigan border. It is combining five scattered plants in the new building. The company was started in 1899 to make a springless scale and in recent years under Hubert D. Bennett, president since 1924, has made many new precision devices for industry.

300,000 PARTS From One "Acorn" Die

THESE ARE FACTS

4320 threaded parts a day for over three months! That's the record of a single "Acorn" Die cutting .098 — 100″ brass screws with ¼-inch of thread. Moreover, the threads are gage-checked for size and optically inspected for appearance and finish. "Acorn" Dies are accurate, tough, long-lived.

GREENFIELD TAPS DIES DRILLS SCREW PLATES PIPE TOOLS REAMERS GAGES SOLD BY DISTRIBUTORS EVERYWHERE

IN-BUILT PERFORMANCE

Such records are possible because every "Acorn" Die is checked and tested. Whether you require a standard die or a special die makes no difference. Every "Acorn" Die is "special" in that it has been individually tested.

GREENFIELD TAP & DIE CORPORATION
Greenfield, Mass.
Detroit Plant: 2102 West Fort St.
Warehouses in New York, Chicago, Los Angeles and San Francisco
In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

GREENFIELD

War Fears Cancel Visit of 300 British Engineers to U. S.

NEW YORK—Unsettled conditions in Europe made it necessary for 300 British engineers, members of the Institution of Civil Engineers and the Institution of Mechanical Engineers, many of whom are key men in Great Britain's industrial mobilization scheme, to cancel their plans to sail Aug. 26 for the United States. They were to participate with the American Society of Civil Engineers, the American Society of Mechanical Engineers, and the Engineering Institute of Canada in a "British-American Engineering Congress," to be held in New York, Sept. 4-8.

Largest British Blast Furnace Is Blown in

LONDON—By far the largest blast furnace in the United Kingdom was recently put into commission by the Appleby-Frodingham Steel Co., Scunthorpe. Two hundred feet high, the furnace is almost twice as big as the average blast furnace in Britain, and is capable of producing 3500 long tons of pig iron per week, using the local Frodingham ironstone. If the new furnace were smelting American ores, which have a bigger iron content, it would be capable of turning out 1000 tons of pig iron daily.

Another furnace of similar design is to be started almost immediately. The two furnaces together form the principal part of a $15,000,000 extension plant by the Appleby-Frodingham Co.

British May Create Iron Ore Reserve

DISCUSSONS are proceeding between the British Ministry of Supply and the British Iron and Steel Federation regarding the acquisition of a national reserve of 1,000,000 tons of iron ore, representing about one-seventh of the current annual consumption.

Grumman Aircraft Expands

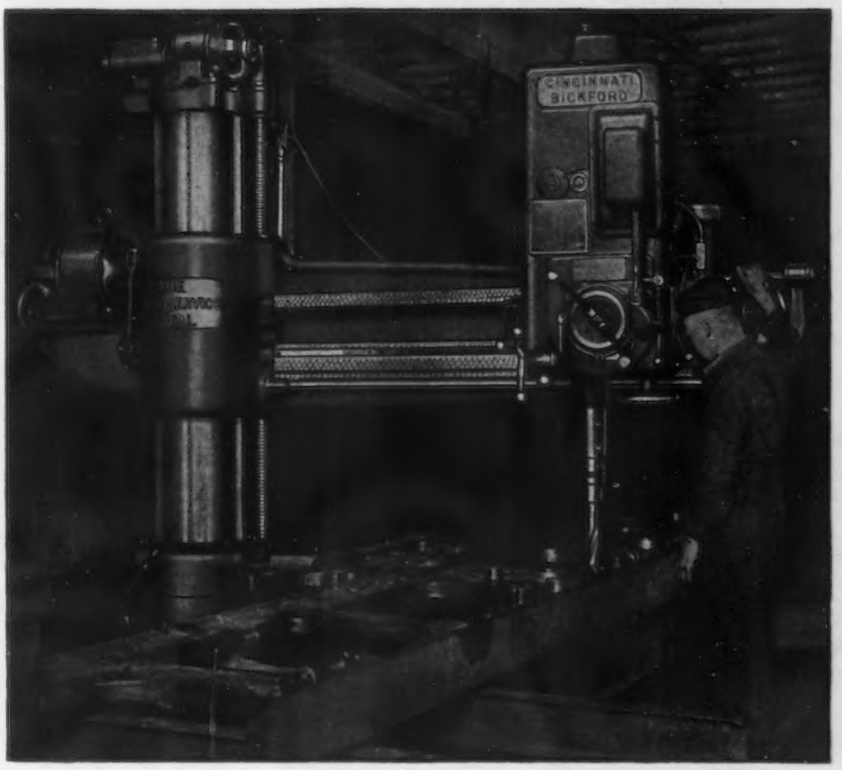
CLEVELAND — Grumman Aircraft Engineering Corp. will increase the manufacturing space of its plant at Bethpage, L. I., by 48,000 sq. ft., according to L. R. Grumman, president. Work under direction of the Austin Co. will begin Sept. 1. Grumman now has a backlog of $4,600,000 exclusive of anticipated 1939 business, according to the announcement concerning the new plant.

Allis-Chalmers Offers Guide to New Workmen

CHICAGO—Desire of the Allis-Chalmers Mfg. Co., Milwaukee, for good employee relations is exemplified by a 40-page booklet which is handed to all new employees as they enter the employ of the company and which has been distributed to all of the present workers. After welcoming the new employee the booklet lists provisions made by the company for personal welfare, apprentices, relief, safety, labor, advice, hospitals, accident compensation, unemployment insurance, mutual aid society, group insurance, visiting nurse service, legal advice, credit union, and other subjects.

Apex Electric to Double Capacity at Sandusky

THE Holland-Rieger Division of Apex Electric Mfg. Co., Cleveland, have let a contract to the Ferro Enamel Corp., Cleveland, to double the production-capacity of their Sandusky, Ohio, plant.



Convenient Low Controls
At the Head
Essential For Work Like This

Especially on big work centralized control at the drilling position makes important savings. Controls for all speeds and feeds—electric column clamping—arm clamping and elevation to the arm—power rapid traverse—controls for these and all other operations of the SUPER SERVICE RADIAL DRILLS are always within easy reach from the drilling position. Think what time and energy are wasted when that is not the case! Yet most of the radial drills in use today do not have this money saving feature of 100% centralized control at the head. Do yours?

Write for Bulletin R-24.

THE CINCINNATI BICKFORD TOOL CO.
OAKLEY CINCINNATI OHIO U.S.A.

. . . THE NEWS IN BRIEF . . .

New U. S. Air bases to cost $30,000,000; Albert Kahn gets architectural engineering contract.—Page 51.

Government steel orders for Aug. 19 week total $4,968,686; machinery awards $1,080,794.—Page 51.

Greater use of sheet steel predicted for 1940 cars by Plymouth; assemblies rise to 17,465; heavier steel releases await stronger schedules.—Page 52.

War Department ready to post guards to prevent sabotage in industrial centers.—Page 56.

Secretary Hopkins organizes industrial economic division, steals march on FTC.—Page 58.

Concrete Reinforcing Steel Institute meeting to be held at Hershey, Pa., Sept. 14-16.—Page 58.

Navy Supplies department purchases lathes, electric furnaces.—Page 60.

CIO mine union wins election, 451 votes to 81, at Woodward, Ala.—Page 60.

Soviet-Nazi agreement seen as affecting U. S. manganese supplies.—Page 60.

U. S. plans first comprehensive trade pact since 1855 with Argentina.—Page 60.

Steel exports from U. S. to Argentine advance in July.—Page 62.

ICC issues ruling on wrought iron pipe all-rail and ocean-rail rates.—Page 62.

Grand Coulee Dam contracts are awarded by Reclamation Bureau.—Page 63.

Aircraft built by U. S. for export so far this year total 855.—Page 63.

Procurement Division purchasing runs behind Roosevelt's expectations.—Page 63.

Fifty-six technical papers are scheduled for American Welding Society's meeting at Chicago.—Page 63.

Steel industry pays out $10,000,000 for research during 1939.—Page 64.

Metal box with hopper front used by Atlas Bolt & Screw Co.—Page 64.

Toledo Scale Co. combines five plants in one.—Page 64.

Brazil cancels British iron ore concession in Minaes Geraes.—Page 64.

War fears cancel visit of 300 British engineers to Engineering Congress at New York.—Page 65.

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MEETINGS

Sept. 4 to 8—British-American Engineering Congress, New York.

Sept. 8 and 9—American Ceramic Society, Conneaut Lake, Pa.

Sept. 14 to 17—National Association of Foremen, Pittsburgh.

Sept. 20 to 22—National Industrial Advertisers Association, New York.

Sept. 26 to 29—Association of Iron and Steel Engineers, Pittsburgh.

Oct. 4 to 13—National Machine Tool Builders' Association, Cleveland.

Oct. 5 to 7—Society of Automotive Engineers, aircraft production meeting, Los Angeles.

Oct. 6 to 7—Foundry Equipment Manufacturers Association, White Sulphur Springs, W. Va.

Oct. 16—Society of Automotive Engineers, annual dinner, New York.

Oct. 16 to 20—National Safety Congress and Exposition, Atlantic City, N. J.

Oct. 23 to 27—National Metal Congress, Chicago.

Grumman Aircraft, with a $4,600,000 backlog, will expand Bethpage, L. I., plant.—Page 65.

Allis-Chalmers Mfg. Co. offers guidebook to new workmen.—Page 65.

Apex Electric to double capacity at Sandusky.—Page 65.

Largest British blast furnace is blown in.—Page 65.

British may create iron ore reserve.—Page 65.

Effects of aluminum on galvanizing bath are described for Hot Dip Association meeting at Cleveland.—Page 72.

The Iron Age capital goods activity index regains lost ground as automobile assemblies advance.—Page 73.

Demonstrates new oil-less circuit breaker.—Page 85.

80,000-Ton coke order for France booked in United States.—Page 85.

Due to crisis abroad, American steel exporting group has ceased quoting in foreign currencies.—Page 85.

First half-year production of pig iron and ferroalloys in U. S. is 12,656,942 tons against 8,104,021 tons in corresponding 1938 period.—Page 85.

Navy Department supplies bureau awards three cable contracts.—Page 87.

World consumption of tin 7 per cent lower in first half of 1939.—Page 89.

Machine tool bookings, despite new European crisis, hold at previous week's level.—Page 90.

Industrial gear sales.—Page 90.

Steel framing may be used in Detroit housing projects.

Class I railroads in U. S. earn a rate of 1.66 per cent on investments in first seven months of 1939.

MORGAN ROD COIL EQUIPMENT IS *Smooth Going*

Improved chain conveyors, coil transfers and hook carriers as designed and built by Morgan assure smooth and dependable flow of material, perfectly synchronized with production. This equipment combines many new and exclusive features to meet the demands of modern rod mills for speedier, safer, and more economical movement of rod coils.

Morgan engineers are specialists in advanced mill practice, with broad experience in levelling out production lags. Their careful studies often point the way to new economies and more profitable operation.

MORGAN CONSTRUCTION COMPANY
WORCESTER, MASSACHUSETTS, U.S.A.

R-59

LET MORGAN (WORCESTER ENGINEERS AND MANUFACTURERS) REMOVE THE LAGS

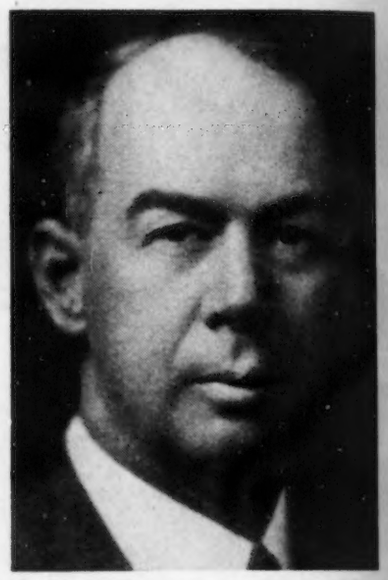
W. E. KERCHEVAL has been placed in charge of the newly-established branch office at Louisville, Ky., of the Allis-Chalmers Mfg. Co., Milwaukee. A new branch has been established at La Porte, Ind., with B. L. MARGESON, formerly in charge of the company's Rockford, Ill., office, in charge. J. J. BREUTZMAN, formerly at the Chicago office, will succeed Mr. Margeson at Rockford. A. B. FROST has been appointed branch manager at the New Haven, Conn., office to succeed E. D. HILL, who resigned because of illness.

H. V. HULEGUARD, for the past three years sales manager of the diesel locomotive division of Baldwin Locomotive Works, Philadelphia, has been appointed general manager of the Whitcomb Locomotive Co., Rochelle, Ill., a subsidiary of the Baldwin company. Effective Sept. 1, the Whitcomb sales and engineering departments which have been concentrated at Philadelphia, will be transferred to Rochelle. Mr. Huleguard was formerly general sales manager of the Whitcomb company.

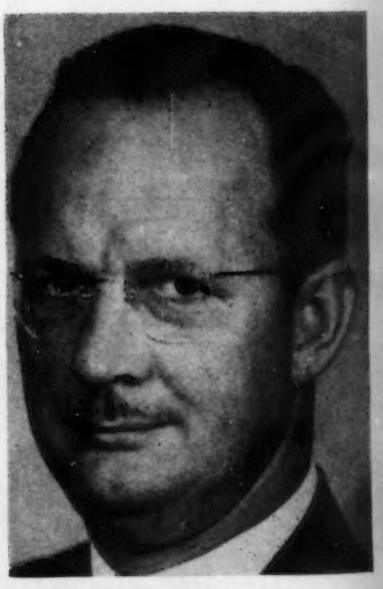
PRODUCTS
Steel Castings
Forgings
Rolled Wheels
Heavy Springs
Rolled Rings
Gear Blanks
STEEL CASTINGS THAT DEMAND EXPERIENCE
This casting — a steel stern frame—typifies the class of difficult steel castings produced by Standard. Prompt service in the production of steel castings and heavy forgings is made possible by our ample equipment and broad experience.
The steel used in Standard's products is acid open hearth produced in our own furnaces under close metallurgical control.
STANDARD STEEL WORKS CO.
Subsidiary of
The Baldwin Locomotive Works
PHILADELPHIA PA.
WORKS: BURNHAM, PA.
STANDARD

. . . PERSONALS

J. A. SHARKEY has been appointed general manager of the new General Rivet division of Milford Rivet Co. The division, formerly the General Rivet Co. of Cleveland, has been moved to Elyria, Ohio. Headquarters



JOHN G. MUNSON, whose appointment as vice-president, raw materials, United States Steel Corp. of Delaware was announced in these columns last week.



ARTHUR N. VOGT, new Youngstown district sales manager for Youngstown Sheet & Tube Co. Details of his career were given in these columns last week.

SALS . . .

of the Milford Rivet Co. are at Milford, Conn.

❖ ❖ ❖

C. S. SORENSEN, formerly with Thompson Products, Inc., Cleveland, is now associated with the Weatherhead Co., Cleveland, as assistant to the general manager.

❖ ❖ ❖

FRANK S. CAPELLO, since 1924 efficiency man on the staff of the general superintendent of the Schenectady works of General Electric Co., has retired. He joined the company 47 years ago and, except for three years in government employ, has been connected with the company ever since. For the past 15 years he has been attached to the staff of the general superintendent of the Schenectady works.

❖ ❖ ❖

W. H. SPENCER, heretofore technical director of the Sealed Power Corp., Muskegon, Mich., has been made manager of the foundry division of the Wilkening Mfg. Co., Philadelphia. He was graduated from Vanderbilt University in 1926 and immediately joined the American Cast Iron Pipe Co. as metallurgist, remaining with that company through 1934, when he joined the

KENNETH T. FRENCH, who is in charge of the newly-established warehouse in Toledo of Allegheny Ludlum Steel Corp. Announcement of his appointment appeared in the issue of Aug. 24.

J. DOUGLAS DARBY, whose appointment as manager of sales in the Philadelphia district for Carnegie-Illinois Steel Corp. was announced last week.

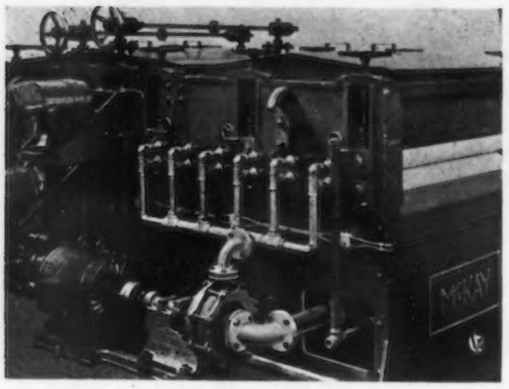
LEADING enamelers quickly recognize the outstanding superiorities of GOHI Enameling Iron and the many production advantages made possible through its use, with the result that this fine metal is accorded top rating by those who demand the utmost in performance, whose manufacturing facilities are geared up to highest operating efficiency.

GOHI Enameling Iron is metallurgically pure, free from grease and pickle marks. The smooth, satiny surface holds the enamel tightly — many common enameling troubles are eliminated, and the appearance and longevity of the finished product are immeasurably improved.

NEWPORT PRODUCTS
Hot Rolled Sheets • Cold Rolled Sheets • Newport Electrical Sheets • GOHI Pure Iron-Copper Alloy Sheets • Globe Brand Galvanized Steel Sheets, Roofing and Siding • GOHI Enameling Iron Sheets • KCB Copper Steel Sheets • Newport Long Terne Sheets • Newport Galvannealed and DeLuxe Metal Sheets.

THE NEWPORT ROLLING MILL CO.
NEWPORT KENTUCKY
DIVISION OF THE ANDREWS STEEL CO.

ANDREWS PRODUCTS IN CARBON AND ALLOY STEEL: Blooms • Forging Billets • Re-rolling Billets • Slabs • Universal Mill Plates • Sheet Bars



Durimet for alkaline solutions

The Durimet (stainless steel) centrifugal pump used in the McKay Scrubber circulates the alkaline scrubbing liquor at the rate of 270 g.p.m.

Durimet, a special nickel-chromium-molybdenum corrosion-resisting alloy steel, will handle not only alkaline solutions but also acid solutions equally well. From Durimet is made standard finished equipment, such as pumps, valves, pipe fittings and castings, and also special equipment made to suit the customer's requirements.

There may be parts of your product which could be made advantageously of Durimet for corrosion-resistance and long life. We shall be glad to discuss with you the application of Durimet to your use.

Send us your blueprints for analysis and recommendations.

THE DURIRON COMPANY, Inc.
438 N. Findlay St. Dayton, Ohio

if you let **DUNBAR** *design your springs and make them, too"*

BROS. COMPANY

DIVISION OF ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT
Quality Springs since 1845

Sealed Power Corp. in a similar capacity. He is a member of the Society of Automotive Engineers and of the American Foundrymen's Association, of which he is vice-chairman of the gray iron divisional committee.

ROBERT E. HUNT, who has been in charge of engine development in the engineering department of the Reo Motor Car Co., has been appointed engineer in charge of research and product development of the Wilkening Mfg. Co. He was graduated from Michigan State College in 1933.

❖ ❖ ❖

H. E. BILLINGTON, who has been vice-president in charge of sales of the Kellogg Switchboard & Supply Co., Chicago, since 1937, has been elected executive vice-president. He joined the company in 1927 as manager of telephone sales and became general sales manager four years later

CAST IRON PIPE

Hartford, Conn., Board of Contract and Supply, is in the market for about 420 tons of 42 and 48-in. cement lined pipe and specials. Specifications by Water Bureau of Metropolitan District, 1026 Main Street.

Yadkinville, N. C., plans pipe lines for water system and other waterworks installation. Fund of about $85,000 is being arranged for this and sewer system.

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., closes bids Sept. 18 for 1450 ft. of 8-in. water pipe, with tees, bends, sleeves, valve, etc. (Circular 56).

Water Department, 14 George Street, Charleston, S. C., plans call for bids early in October for pipe line extensions in water system in St. Andrews Farish district. Cost about $85,000. J. E. Gibson, address noted, is engineer.

Travis County Water Control and Improvement District No. 1, Austin, Tex., now being organized, care of Trimble & Bandy, Inc., Austin, consulting engineer, plans pipe lines for water system in area comprising district, and other waterworks installation. Cost about $85,000.

Gilman, Wis., plans water pipe line system and other waterworks installation. Cost about $60,000. Financing is being arranged through Federal aid. Bids for pipe and other equipment received last January have been rejected and new bids will be asked soon. Frank J. Davy & Son, 502 Main Street, LaCrosse, Wis., are consulting engineers.

Metropolitan Utilities District, Eighteenth and Harney Streets, Omaha, Neb., Col. T. A. Liesen, secretary, has authorized pipe line from connection with system at Ninetieth and Dodge Streets to Boys' Town, near city, for main water supply. Cost about $37,000. Booster pumping unit will be installed for pressure service. Plans also have been approved for pipe lines for water system in districts Nos. 1585, 1589 and 1590, recently created.

Abilene, Tex., will take bids soon for pipe line extensions in water system, including main trunk lines; also for spillway and other structures, pumping stations and other waterworks installation. Cost about $575,000. Financing has been arranged. Robert Hoppe, Abilene, is engineer; R. W. Freese, Fort Worth, Tex., is consulting engineer.

Burbank, Cal., asks bids Sept. 5 on 616 tons of 6, 8 and 10-in. pipe, class 250.

Lynwood, Cal., asks bids Sept. 5 on 16,000 ft. of 6-in. and 3200 ft. of 8-in. pipe.

Bureau of Yards and Docks, Washington, asks bids Sept. 6 for constructing water and sewer systems at naval air station, Alameda, Cal., involving substantial tonnages of 6, 8, and 12-in. pipe (Specifications 8614).

. . . OBITUARY . . .

FRED BLUMENTHAL, former president of the old Midwest Can Co., Milwaukee, Wis., died of apoplexy at Grant hospital in Chicago, Aug. 12, aged 46 years. He was president of the Arrow Crown & Cap Co.

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PETER F. MORK, a resident of Beloit, Wis., since 1910 when he purchased the foundry business owned by the Slater, Marsden & Whittemore Co., died at a Beloit hospital Aug. 11, from injuries sustained in a fall a short time before. Active in South Beloit business enterprises, Mr. Mork, in addition to operating the foundry, in 1923 purchased the Slater & Tuck factory which included another foundry. He was 77 years old.

C. R. ELLICOTT, general manager of the Cambria plant of Bethlehem Steel Co., whose death was announced in these columns last week.

WILLIAM E. CRUMLEY, formerly assistant superintendent of the old Wadsworth Motor Car Co., was buried Aug. 22 at Lakeview, Mich. Mr. Crumley was 64 years old and for 27 years had been a resident of Detroit. He at one time was associated with Cadillac Motor Car Co. and the Wilson Body Co. He had lived in Louisville, Ky., in recent years.

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FRANK X. KRAFT, for 40 years associated with the foundry industry in Detroit, was buried Aug. 24. Born in Port Huron, Mich., 64 years ago, he had lived in Detroit 60 years. For 40 years he was with the Cope-Swift Foundry Co. as a foreman and he remained with it when the name was changed to Swift Mfg. Co.

❖ ❖ ❖

WILLIAM H. MUSSEY, engineer of research for the Pullman-Standard Car Mfg. Co., died last week in Chicago, aged 65 years, after a brief illness. Educated at Lehigh University, Mr. Mussey obtained his early engineering experience with the Baldwin Locomotive Co., Lehigh Valley Railroad, Long Island Railroad and in the metallurgical mining field in Colorado. In 1921 Mr. Mussey was appointed chief engineer of Pullman-Standard, being promoted to general mechanical engineer in 1927. He was named engineer of research in 1935.

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THEODORE W. BEADLE, secretary of the Illinois Steel Bridge Co., Jacksonville, Ill., died recently from a heart attack, aged 60 years.

Complete PIPE MAKING *Equipment*
from Skelp to the finished pipe–

1 Flat skelp before being made into pipe.
2 Skelp entering charging end of heating furnace.
3 Skelp leaving furnace, entering mill and being cut to length by hot saw.
4 The finished product.
5 Batch type billet heating furnace for heating billets before piercing.

If you are in business to MAKE PIPE you will be interested in what "Salem" has to offer.

Three complete plants similar to that illustrated are now being designed and installed by Salem Engineering Company.

"Salem" is well-equipped —with actual experience —to supply and install every piece of equipment from the skelp handling crane to the finished pipe at any point on the finishing floor.

For revisions to present mills, may we offer you our rotary hearth or batch type billet heating furnaces (illustration No. 5), tube reheating furnaces, and annealing and drawing furnace equipment.

"Salem's" Newest Pipe Annealing Installation is A TUBULAR FURNACE FOR TUBULAR PRODUCTS.
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SALEM ENGINEERING COMPANY

Effect of Aluminum on Galvanizing Bath Described for Hot Dip Meeting

CLEVELAND — Varied technical problems, centering principally around embrittlement, dross accumulations and zinc coating tests, featured the semi-annual meeting of the American Hot Dip Galvanizers Association here, Aug. 24 and 25, in Hotel Statler.

Directors voted to extend the association for another two fiscal years, decided to study methods of testing valuations of zinc coatings, appointed a committee to study embrittlement, and moved for further study of dross accumulations.

The two-day meeting opened with a technical session, presided over by I. M. Herrmann, Acme Galvanizing, Inc., Milwaukee, president of the Association.

Aluminum additions to a galvanizing bath are affected by many factors, said W. G. Imhoff, technical director of research of the association, speaking at the session.

Temperature Important

The bath temperature itself is important, he continued. A shortage of aluminum will tend to develop a white frosted coating. The aluminum affects the fluxing conditions, and the amount of aluminum also affects yellow stains and tends to clear them up.

Other factors mentioned by the speaker included the production put through the bath; surface area; iron in the bath; oxides and inclusions in the bath; scruff and dirt in the coating.

Aluminum has an influence on the spangle, he continued. It tends to give a bright smooth finish; has definite effect according to other metals such as tin that may be in the bath. The amount of aluminum varies in different fields of galvanizing.

Mr. Imhoff offered tentative specifications for practical additions and amounts of aluminum to be used in different fields of galvanizing.

Grief in the Shop

A few of the many problems confronting the job galvanizer were discussed by J. B. Tate, Witt Cornice Co., Cincinnati, whose topic was, "Grief in a Galvanizing Shop." The speaker said his experience has proved that a cold bath will produce larger, brighter spangles than a hot bath. Galvanizing in itself, he said, will not cause any appreciable amount ot brittleness, but pickling will definitely cause brittleness under certain conditions. He cited a case where wire before pickling showed no sign of brittleness at all, but a quick dip in and out of either muriatic or sulphuric acid caused brittleness.

"Leaving the wire in the acid longer had no further effect, so far as the brittleness was concerned and galvanizing did not affect it further," said Mr. Tate. "In both the pickled and galvanized conditions, after standing for weeks, there was no difference in the degree of brittleness. This occurred in the sharp bends on No. 4 gage wire and when the mill was notified of what was happening it replaced the wire with other which was satisfactory."

Sandblasting, while expensive, is the most satisfactory method of removing heavy scales of rust, he continued. If sandblasting is unavailable, deeply embedded rust can be loosened sufficiently to be removed by ordinary pickling, by heating to a cherry red and allowing to cool. The surest way of removing all paints is by burning either in a furnace built for this purpose or in the galvanizing kettle, he said.

Found Scale Particles

"The quality of the steel base often will cause an unsightly galvanizing job," the speaker continued. "As an example, we galvanize quite a quantity of guy wire protectors for one firm which buys hot rolled strip from two concerns. One particular load of steel, from one mill, when galvanized was completely covered with very small pimples or blisters, while the steel from the other mill, galvanized at the same time, was perfect. The representative of the mill which furnished the bad steel was called in. He took samples, had them analyzed and examined under a microscope and found small particles of scale rolled into the steel, which were too deeply embedded to remove by pickling, yet small amounts of hydrogen penetrated under the scale and when heated to galvanizing temperature in the zinc bath, expanded, causing the rough pimple-like finish."

Experience with gas fired furnace design has shown that the heat supply available for the zinc bath should be flexible and such that it can be drawn into the zinc bath almost instantly or shut off just as quickly, said A. L. Jackson, plant manager, International-Stacey Corp., Columbus, Ohio, in a paper titled, "Temperature Regulation for Hot Dip Galvanizing."

"To secure quality of galvanizing, the work passing through the kettle is graded as much as possible and the temperature of the zinc bath controlled to within ±5 deg. F. of the proper temperature for that grade of material," he said. "We have found that the temperatures will range from 850 deg. F. to 890 deg. F. and that the average will be approximately 865 deg. F. during productive operating time. These temperatures also gives us the best results in economy of operation."

Control of fuel injected into the furnace should be automatic and mechanical, the speaker continued, after describing an installation in detail.

Fuel Is Controlled

"We have controlled the amount of fuel put into the furnace," he said. "We have our furnace designed for the least amount of heat loss. We have been sure to transfer the heat to the kettle and zinc bath at the right place. We have also made certain that temperature of the zinc bath has been tied up to the fuel input control mechanism. This is temperature regulation. It leads to better hot dip galvanizing and economy of operation."

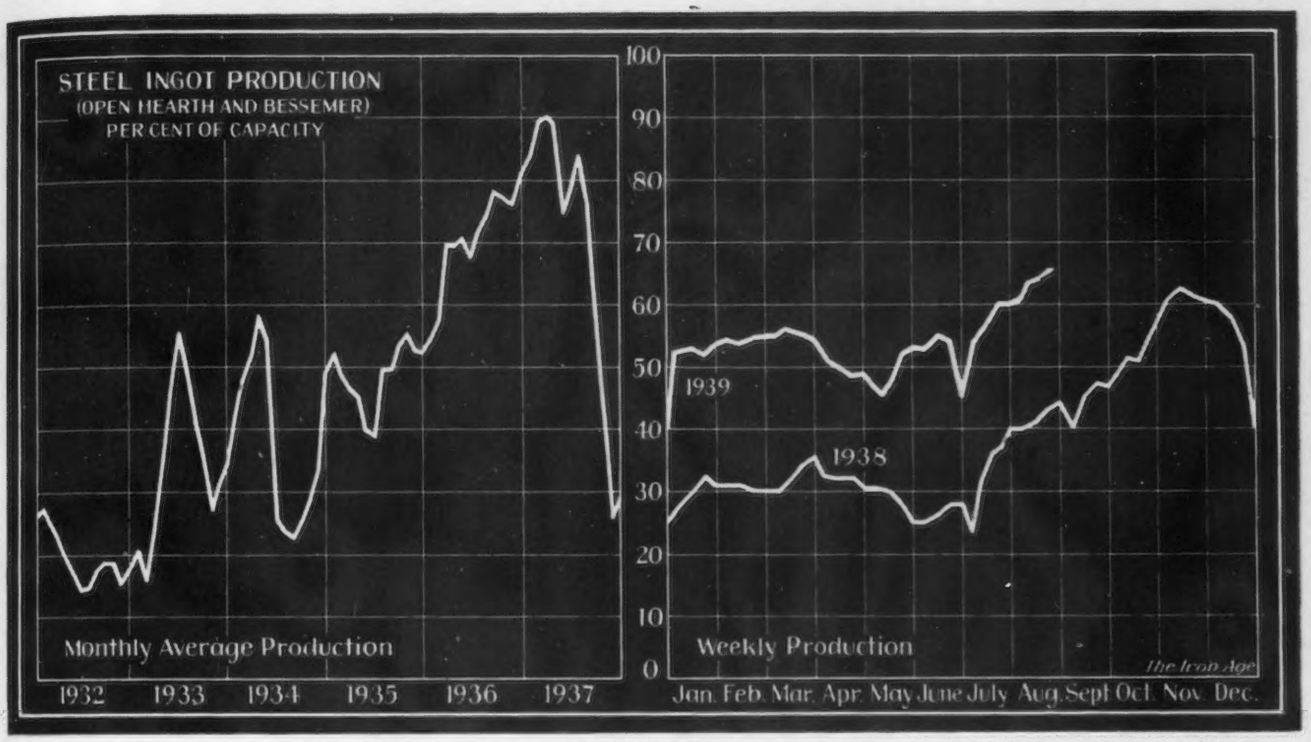
Embrittlement was one of the leading topics in the technical session and evoked considerable discussion. Mr. Imhoff in another address said embrittlement of malleable iron can be caused by two things: incompleted annealing or malleablizing and secondly, improper chemical analysis of the iron. He described the numerous kinds of iron and the types of furnaces used to make white irons and pointed out that the cupola produces most pipe fittings.

He described how use is made of the Flecto process, a special heat treatment covered by patents assigned to the Ohio Brass Co., to eliminate embrittlement before galvanizing.

Dross Accumulations

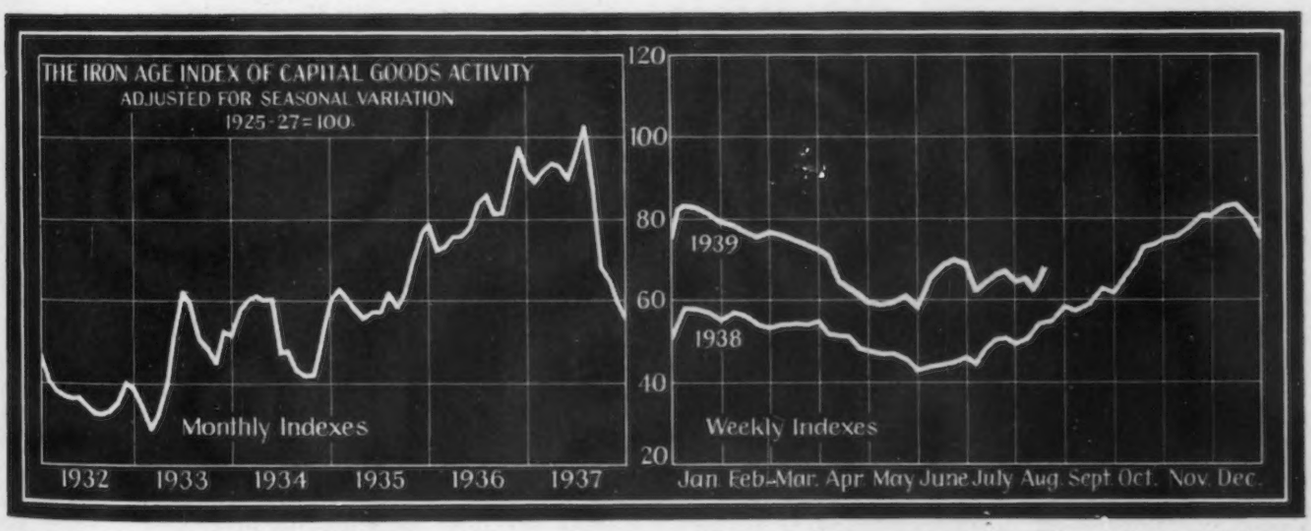
Emphasis was placed on the subject of dross accumulations in the bath. Mr. Imhoff expressed the belief that one of the large sources of dross is from iron dissolved from the article as it goes through the bath in the process of production. He asserted the modern scientific way of handling dross is with a vibrator. Photomicrographs of pure zinc, ordinary commercial zinc, ordinary commercial dross and regular zinc, and ordinary iron oxide and commercial zinc were exhibited by Mr. Imhoff.

Ingot Output at 1939 Peak of 63½%



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	Western	St. Louis	East-ern	Aggre-gate
CURRENT WEEK..	58.0	54.5	56.0	48.0	81.0	64.0	83.0	94.0	75.0	62.5	54.0	66.0	75.0	63.5
PREVIOUS WEEK..	56.0	56.5	58.0	48.0	78.0	61.0	80.0	82.5	78.0	62.5	54.0	60.0	75.0	63.0

Index Regains Lost Ground as Auto Assemblies Rise



WITH the steel output and Pittsburgh factors showing added strength weekly, the increase in automobile assemblies in the past week was all that was necessary to reverse the past trend of THE IRON AGE index of capital goods activity and cause it to move to higher ground. The latest position of the index, for the week ended Aug. 26, is 65.3, as compared with 63.2 in the preceding week and 65.3 three weeks ago. The principal contributor to the upward movement was the automobile component, which jumped 9.5 points in the week as building of 1940 models commenced in earnest. Losses for the week were shown by both the construction and lumber carloadings components. The dollar volume of building contracts reported in the past week slumped 28 per cent, while a small improvement in number of cars of forest products loaded in the week was turned into a loss when adjusted for seasonal trend.

INDEX NUMBERS	Week Ended Aug. 26	Week Ended Aug. 19	Comparable Week 1938	Comparable Week 1929
Steel ingot production[1]	94.9	92.1	62.3	127.1
Automobile production[2]	29.1	19.6	35.6	117.4
Construction contracts[3]	66.9	69.8	67.9	111.1
Forest products carloadings[4]	55.9	56.8	53.5	119.5
Production and shipments, Pittsburgh District[5]	79.9	77.8	53.2	126.8
Combined index	**65.3**	**63.2**	**54.5**	**120.4**

Sources: 1. THE IRON AGE; 2. Ward's Automotive Reports; 3. *Engineering News-Record;* 4. Association of American Railroads; 5. University of Pittsburgh.

. . . SUMMARY OF THE WEEK . . .

. . . Ingot production climbs half point to 63½ per cent, 22-month high.

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. . . War threats obscure outlook, but August orders top July's.

° ° °

. . . Heavier automotive releases help mills; scrap up 16c. to $15.62.

THE steel industry this week finds ingot production rising a half point to a new 22-month peak of 63½ per cent in a market reflecting a further small increase in domestic steel orders but complicated by threats of an impending European war.

While producers believe that within a few months after actual breaking out of general war, the demand on American mills for all kinds of steel products would be intense, likewise an early settlement of Europe's present crisis would increase demand from consumers at home who may become hesitant if war uncertainty continues.

Despite the threatening situation abroad, steel bookings in August continue to show gains of from 2 to 10 per cent above July for most companies, permitting increases in mill operations this week of 2 per cent to 58 per cent at Pittsburgh, three points to 81 per cent at Cleveland, three points to 64 per cent at Buffalo, three points to 83 per cent in the Wheeling-Weirton area and 11½ points to 94 per cent at Detroit. Losses in the ingot rate are shown at Chicago, down two points to 54½, and Youngstown, off the same amount to 56.

These melting rates, accompanied by an advance of 16c. to $15.62 a ton in THE IRON AGE composite scrap price, are being supported by a wide diversification of steel orders in which a slightly lower level of structural business is being made up by automotive and miscellaneous demand. Automotive steel releases are increasing, if not quite in the volume anticipated, and weekly automobile assemblies have climbed to 17,467, causing THE IRON AGE index of capital goods activity to rise to 65.3 from 63.2 last week. Still heavier specifying by the Michigan companies is expected after the Labor Day holiday.

MEANWHILE railroad buying is a bright spot, with the number of cars involved in inquiries reaching almost 7000, the highest in some time. These cars, including 2500 for the Chesapeake & Ohio, 800 cars for the Chicago & North Western and 250 cars for the New Haven railroad would require more than 80,000 tons of steel. New railroad repair programs include modernizing of 200 cars by Missouri Pacific while the Baltimore & Ohio is to build 180 automobile cars in its own shops.

Signs of a possible shortage of bottoms draw attention to the shipbuilding industry where three new vessels awarded this week and five more ships to be let shortly will require more than 20,000 tons of steel. The Navy has given a $4,702,240 contract for plates to Carnegie-Illinois Steel Corp. and has ordered 3500 tons of wide flange beams.

STRUCTURAL steel lettings the past week totaled 13,000 tons, compared with 16,450 tons a week earlier, the leading new awards being 1600 tons for a Long Island Railroad grade crossing elimination, 1455 tons for the Champion Paper & Fiber Co. mill at Pasadena, Tex., and 1400 tons for a viaduct and approaches at Providence. New structural projects are slightly lower at 16,620 tons and include 5000 tons for the New England Mutual Life Insurance Co. building at Boston, 3600 tons for a power house extension for the Public Service Electric & Gas Co. at Burlington, N. J., and 1700 tons at Edgewater, N. J., for the Hills Brothers Coffee Co. project.

The fabricated structural steel industry during the first seven months of 1939 booked 776,922 tons, compared with 586,113 tons in the like 1938 period.

REINFORCING bar awards have increased 8900 tons from 6610 tons last week, the largest job being 2900 tons for a housing project at Chicago. The Cleveland municipal light plant contract calling for 1800 tons has also been awarded. New reinforcing projects include 8300 tons.

Production of pig iron and ferroalloys in the first six months of 1939 was 12,656,942 tons compared with 8,104,021 tons in the corresponding period last year and 11,056,840 tons in the last half of 1938, according to figures just released by the American Iron & Steel Institute. Steel exports from the United States were off 26,370 tons in July to 163,598 tons, while scrap exports dropped 48,822 tons to 350,066 tons.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

Per Gross Ton:	Aug. 29, 1939	Aug. 22, 1939	Aug. 1, 1939	Aug. 30, *1938
Rails, heavy, at mill	$40.00	$40.00	$40.00	$42.50
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	40.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point.	34.00	34.00	34.00	34.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	34.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	40.00
Wire rods: Nos. 4 and 5, Pittsburgh, Chicago, Cleveland	43.00	43.00	43.00	43.00
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows rows Point, cents per lb...	1.90	1.90	1.90	1.90

Finished Steel

Cents Per Lb.:				
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.15	2.15	2.15	2.25
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont	2.10	2.10	2.10	2.10
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham ..	2.10	2.10	2.10	2.10
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.65	2.65	2.65	2.70
Alloy bars: Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton	2.70	2.70	2.70	2.80
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.00	2.00	2.00	2.15
Cold rolled strip: Pittsburgh, Cleveland, Youngstown ...	2.80	2.80	2.80	2.95
Sheets, galv., No. 24: Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham..	3.50	3.50	3.50	3.50
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown .	2.00	2.00	2.00	2.15
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown ...	3.05	3.05	3.05	3.20
Wire nails: Pittsburgh, Chicago, Cleveland, Birmingham	2.40	2.40	2.40	2.45
Plain wire: Pittsburgh, Chicago, Cleveland, Birmingham	2.60	2.60	2.60	2.60
Barbed wire, galv.: Pittsburgh, Chicago, Cleveland, Birmingham	†3.25	3.25	3.25	3.20
Tin plate, 100 lb. base box: Pittsburgh and Gary	$5.00	$5.00	$5.00	‡$5.35

*Pittsburgh prices only.
†Applies to 80-rod spools only.
‡Subject to post-season adjustment.

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Pig Iron

Per Gross Ton:				
No. 2 fdy., Philadelphia	$22.84	$22.84	$22.84	$21.84
No. 2, Valley furnace	21.00	21.00	21.00	20.00
No. 2, Southern Cin'ti	21.06	21.06	21.06	20.06
No. 2, Birmingham	17.38	17.38	17.38	16.38
No. 2, foundry, Chicago†	21.00	21.00	21.00	20.00
Basic, del'd eastern Pa.	22.34	22.34	22.34	21.34
Basic, Valley furnace	20.50	20.50	20.50	19.50
Malleable, Chicago†	21.00	21.00	21.00	20.00
Malleable, Valley	21.00	21.00	21.00	20.00
L. S. charcoal, Chicago	28.34	28.34	28.34	28.34
Ferromanganese, seab'd carlots	80.00	80.00	80.00	92.50

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.

Scrap

Per Gross Ton:				
Heavy melting steel, P'gh	$16.25	$16.25	$15.875	$15.50
Heavy melting steel, Phila.	16.75	16.25	15.75	14.25
Heavy melting steel, Ch'go.	13.875	13.875	13.875	13.75
Carwheels, Chicago	12.75	12.75	12.75	14.25
Carwheels, Philadelphia	16.25	16.25	16.00	17.25
No. 1 cast, Pittsburgh	16.00	15.75	15.25	15.25
No. 1 cast, Philadelphia	16.75	16.75	16.75	16.25
No. 1 cast, Ch'go (net ton)	12.75	12.75	12.75	13.25

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$3.75	$3.75	$3.75	$3.75
Foundry coke, prompt	4.75	4.75	4.75	4.75

Non-Ferrous Metals

Cents per Lb. to Large Buyers:				
Copper, Electrolytic, Conn.	10.50	10.50	10.375	10.125
Copper, Lake, New York	10.50	10.50	10.375	10.25
Tin (Straits), New York	49.125	48.65	48.45	43.30
Zinc, East St. Louis	4.75	4.75	4.60	4.75
Zinc, New York	5.14	5.14	4.99	5.14
Lead, St. Louis	4.90	4.90	4.80	4.75
Lead, New York	5.05	5.05	4.95	4.90
Antimony (Asiatic), N. Y.	14.00	14.00	14.00	14.00

The Iron Age Composite Prices

	Finished Steel	Pig Iron	Steel Scrap
Aug. 29, 1939	2.236c. a Lb.	$20.61 a Gross Ton	$15.62 a Gross Ton
One week ago	2.236	20.61	15.46
One month ago	2.236	20.61	15.17
One year ago	2.300	19.61	14.50

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	Finished Steel — High	Finished Steel — Low	Pig Iron — High	Pig Iron — Low	Steel Scrap — High	Steel Scrap — Low
1939	2.286c., Jan. 3	2.236c., May 16	.....	.....	$15.62, Aug. 29	$14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	$23.25, June 21	$19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.223c., Apr. 2	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3
1928	2.192c., Dec. 11	2.142c., July 10	18.59, Nov. 27	17.04, July 24	16.50, Dec. 31	13.08, July 9

. . . THIS WEEK'S MARKET NEWS . . .

PRICES

. . . Firming-up process continues for most products

PRICES on almost all steel products continue to strengthen, despite pressure from some consumers who had not yet tested the stability which now seems to characterize the market. From most districts come reports that the general firming-up of prices continues. Nail quotations have improved recently. Possibilities of war in Europe have aroused interest in export prices.

NEW BUSINESS

. . . Producers study possible effects of war; domestic orders gain

STEEL manufacturers this week were busily endeavoring to appraise the probable buying trend over the next few months in deep shadows cast by possibilities of a new European war.

Already there has been a sharp increase in the number of inquiries from potentially belligerent countries and from neutrals who may be forced to shift their source of supply to the United States. So far no sizable influx of orders has come from abroad, while the export demand currently is coming for the most part from South America, Japan and Scandinavian countries. Japan, faced with treaty uncertainty, shows evidence of buying more heavily in the United States.

Despite some hesitation among some steel consumers as a result of the critical course of world events, domestic business is showing further slight gains, with August bookings of steel products likely to range from 2 to 10 per cent above July and the outlook brightening.

Steel specifications at PITTSBURGH in the past week were slightly in excess of the previous week. While there appears to be a slowing up in the demand for some products, this has been more than made up by heavier sheet and strip specifications. Preponderance of the improvement noted in the past week is due almost entirely to support from automobile centers. Nonetheless, miscellaneous demand at this time shows no signs of weakening.

Despite a very heavy modest easing in demand for steel noticeable this week at CLEVELAND and YOUNGSTOWN, attributable mostly to the influence of the forthcoming holiday, August proved a better month than expected in comparison to July. Optimism for September is quite evident. Suppliers of the automotive industry are increasingly active and expect releases from the Michigan manufacturers to be stepped up at any moment.

Railroad buying has picked up at CLEVELAND, with the C. & O. out for 2500 cars and another carrier considering the purchase of 1000 cars. Carnegie-Illinois Steel Corp. has been awarded 1240 tons of reinforcing bars for the Cleveland municipal light plant expansion and 800 tons of piling for the same project.

August business in the CHICAGO area continues to hold up very well. It is considered almost certain that incoming business and operations will increase during the fall months. More optimism is being expressed concerning the outlook than at any other time this year. Credit must be given to the general consumers, as this optimism is based largely upon the expected continuance of this type of buying.

Heavy sheet releases are anticipated this week and next from Fisher Body and General Motors. Tin plate releases are slackening seasonally, with October probable as the low point before production begins again on spring goods. Miscellaneous buying is the chief support of the bar market, which is fairly active at present. Among the important buying groups in CHICAGO currently are manufacturers of farm implements, farm and industrial tractors, automobiles and automobile parts, electrical products, the miscellaneous classification, forgers and jobbers.

Some action may be taken within 30 days on the 800 cars under consideration by the Chicago and North Western Railroad.

Although new bookings in PHILADELPHIA continue to hold at very low levels due to the fact that most consumers obtained extensive coverage before the various changes in base prices and extras went into effect, optimism is felt concerning the future for there are indications that material covered by these contracts is being taken in better volume than had been anticipated.

An independent shipbuilder in the PHILADELPHIA district placed contracts for about 3500 tons of plates with two mills covering a repair boat recently booked, dividing the order between two mills. Bethlehem Steel Co. has booked an order for three boats from Seas Shipping Co. which will take an estimated 10,500 tons of plates and shapes, and Sun Shipbuilding & Dry Dock Co. is expected to be awarded shortly five C-1 cargo boats which will require about 10,000 tons of steel.

OPERATIONS

. . . Mill schedules climb half point to 63½ per cent level

STEEL ingot production this week advanced a half point to 63½ per cent of capacity, again establishing a new high point for 1939 and topping by a narrow margin the 1938 high level of operations. Mill schedules are now back to the level of the fall of 1937.

Only two steel producing areas show a decline in activity, the CHICAGO area dropping two points to 54½ per cent and the Youngstown district sagging two points to 56 per cent. Six other districts reported an increase in operations and remaining areas found production unchanged.

PITTSBURGH operations rose two points to 58 per cent, CLEVELAND three points to 81 per cent, BUFFALO three points to 64 per cent, WHEELING-WEIRTON three points to 83 per cent, DETROIT 11½ points to 94 per cent, and ST. LOUIS six points to 60 per cent.

All districts reported no unusual stocking of steel ingots or semi-finished steel at the plants although some preparation is being made to fill promptly anticipated increases in automotive releases.

PIG IRON

. . . Inquiries received from Britain, Scandinavian countries

INQUIRIES from Great Britain and the Scandinavian nations and "feelers" from Eastern export brokers have been noted at CLEVELAND recently. Export prices, however, are still low and difficulty is anticipated in obtaining bottoms. A Scandinavian vessel line which runs direct from the Great Lakes to European ports expects to augment its service by a dozen

or more ships in the next few weeks but is unable to quote definite rates. Unshipped export tonnage is said to be in excess of 10,000 tons at PITTSBURGH, where little or no change in the volume of new business and releases was noted in the past week. For some time a fair amount of new business has been booked at published prices and a moderate amount of contracts have been closed at the current price also. Some old tonnage at last fall's price level remains to be shipped but the amount of such tonnage is small and is expected to be cleaned up within the next month.

Pig iron and foundry coke shipments are well ahead of a month ago in the CHICAGO territory, ranging as high as 20 per cent in some cases. September and October shipping estimates show substantial increases over current totals.

The movement of pig iron to ST. LOUIS melters during the first half of August, according to principal shippers, is about 10 per cent larger than during the same time in July, and indications point to a gain for the entire month of about 15 per cent. Consumer inventories in many instances are of small size, and replenishment can not be much longer postponed. Specialty makers, including stove and furnace manufacturers and the farm implement interests, are accounting for good tonnages.

The crisis in Europe has caused several of the larger users of pig iron in the NEW YORK area to replenish their stocks against a possible tight situation, should war break out. Orders on this account have averaged around 500 tons apiece. Delivery will begin at once, but undoubtedly some of this tonnage will be carried over into the fourth quarter, in effect carrying over present prices to that quarter.

The upward trend in orders and shipments noted in the past few weeks in the NEW YORK district continues, making the August volume substantially better than that of July. Foundry activity is still spotty, although there has been a noticeable increase in jobbing foundry melt.

Republic Steel announced last week that it expected to rebuild and enlarge its No. 1 furnace, in the BIRMINGHAM district, just as soon as No. 2 furnace is relined. This is now in progress. Work on No. 1 furnace is expected to start around the middle of September. Furnace operations are unchanged.

The BOSTON market continues to show a little more life, but as yet there is no real volume to business. The average foundry, although doing more business than a month ago, is coasting along with low inventories and makes no bones of saying it sees no reason to buy heavily unless the price is advanced.

The pig iron market at CINCINNATI continues to be without interesting feature. Small amounts of iron are being purchased from time to time, but the latest activity among melters is to clear up "bargain" contracts since furnace interests generally indicate that these will not be rewritten in the next quarter. The melt remains unchanged at about 50 to 55 per cent of foundry capacity. The number one blast furnace at the Hamilton Iron & Coke Co. is expected to go into production of merchant iron early in September.

Pig iron sales at TORONTO for the past week showed some further gain, although melters still adhere to hand-to-mouth buying. With no indication of early change in iron prices, melters as a whole are satisfied to sit back and order supplies as demands dictate and orders placed during the week ranged from a car to 300 tons, with total business slightly in excess of 1200 tons.

PLATES

. . . *Toledo line to require 12,000 tons of pipe*

PLATE tonnage at CLEVELAND is holding close to the July level. Principal outstanding inquiry involves around 12,000 tons of 60-in. pipe for feeders for the Toledo municipal intake line with bids set for Sept. 27. Austin Co. called for bids on Monday on about 1700 tons of structural and plates (80 per cent) for coffee storage bins for the Hills Brothers plant at Edgewater, N. J.

The Navy Department has awarded a contract to the Carnegie-Illinois Steel Corp., for plates at $4,702,240.80. An award also has been made to Carnegie-Illinois by the Navy Department for 3500 tons of wide flange beams.

Plate mills in the EASTERN PENNSYLVANIA district are operating at about 35 per cent of capacity, with government work accounting for the bulk of the output. Miscellaneous demand in that area has fallen off slightly of late, but outlook is still favorable for higher operations this fall when steel needs of shipbuilders are placed. One independent shipbuilder in that district placed contracts for about 3500 tons covering a repair boat recently booked. Tonnage was divided between two mills, one being located outside the Eastern Pennsylvania district. Bethlehem Steel Co. has been awarded three vessels by Seas Shipping Co., requiring close to 10,500 tons of plates and shapes, while the Chester, Pa., builder is expected to be shortly awarded contract for five C-1 cargo boats which will take close to 10,000 tons of steel. The Reading Co. has an inquiry out for 300 to 500 tons of plates for equipment repairs.

WIRE PRODUCTS

. . . *New orders for merchant wire taper at Cleveland*

CLEVELAND reports shipments of merchant wire products have tapered considerably this month and new orders are light. In late September, however, fall demand is likely to begin picking up. Despite the fact prices of farm products are low, good demand for fence and nails is anticipated this fall from agricultural areas. Export sales of barbed wire continue well maintained, from South America for the most part. Prices of this class of business are low, but the volume has been fairly good in recent months.

Total wire sales changed but little at PITTSBURGH in the past week but there are still indications that manufacturers' wire demand is expanding. Some support is coming either directly or indirectly from new automobile production. Movement of wire rods is slightly better, reflecting increased activity at bolt and nut plants. Merchant wire business is about unchanged from a week ago.

CHICAGO wire sellers are receiving the first releases from makers of automobile seat springs, who are getting started on 1940 model contracts. The bulk of this business is yet to come, however, and it is believed that the next two weeks should see these plants well underway. Use of wire by other industrial consumers is holding up well, as is also the case with merchant wire. In September after the crops are in, farmers normally are in the market for fence, the extent of this interest, as always, depending on farm prices, political and international influences, other farm or personal needs, etc. August business is running somewhat ahead of July in the Chicago territory.

SHEETS AND STRIP

. . . *Releases gain at Pittsburgh and Cleveland*

PACED by a better flow of releases from automobile makers, aggregate sheet tonnages at PITTSBURGH increased in the past week from a week

ago. Orders so far this month are still substantially ahead of the volume booked in July. Most of the gain in the past week came from automotive specifications but miscellaneous requirements showed no tendency to decline. Additional support is expected for galvanized sheet production as soon as the Government places additional awards for corn cribs. Bids are to be opened Aug. 30 on 13,750 additional bins, with the stipulation that 5000 of them must be shipped by Oct. 1. Whether the full amount will be purchased depends on the results of a checkup on necessary storage space now being made in the corn belt region. Strip producers at PITTSBURGH have noticed a slight quickening in demand both from miscellaneous and automotive consumers.

CHICAGO sheet producers are still aiming at Sept. 30 as the deadline by which all low-priced tonnage should be shipped to general buyers, but as automobile releases become heavier and heavier, it is increasingly evident that a large part of this business will not leave the mills until October, and perhaps even later. This week and next, Fisher Body and General Motors are expected to release heavy tonnages of sheets and strip. As an indication of the importance today of flat rolled products one Chicago mill now operating at its peak for the year estimates that 50 to 60 per cent of its current business consists of sheets, strip and tin plate. Miscellaneous consumption in this district continues an all-important factor. Prospects for a very good fall depend largely on the maintenance of buying activity from this group.

Sheet and strip orders at CLEVELAND have been running close to the volume in the comparable part of July, but not showing gains. Automotive buys last week consisted of "balancing up" orders rounding out initial purchases released some weeks ago but held up during the labor trouble. Apparently some manufacturers were hampered by the labor controversy to a greater extent than appeared evident at the time.

Most sheet sellers in the NEW YORK area have been receiving sheet specifications in good volume in the past several weeks and believe that practically all remaining material sold at cut prices will be ordered out in time for delivery by the end of September. Many of the recent releases have been set one to two weeks ahead of original schedules of shipment, leading many to believe new orders will come out in fair volume in September. Already there have been substantial tonnages placed at the book price by buyers who underestimated their requirements during the May bargain days. Largely because of the uncertain international situation, however, no quotations are being made for fourth quarter delivery unless covered by earlier commitments. A sharp price increase is not unlikely, should hostilities break out in Europe.

Demand for finished sheets in the SOUTHERN OHIO area dipped to a level of approximately 65 to 70 per cent of capacity during the past week.

SEMI-FINISHED STEEL

. . . Bookings run ahead of August; exports gain

SEMI-FINISHED steel demand continues highly active with a large amount of support coming from non-integrated sheet and strip makers. Orders in the past week are on a par with the previous week but bookings so far this month are running slightly ahead of a month ago. Of principal interest in the CLEVELAND district recently has been a moderate amount of export business, including a tonnage for Japan.

TUBULAR GOODS

. . . August volume continues to lead July

THE total volume of tubular goods sales at PITTSBURGH has changed but little from a week ago. The total of business so far this month continues to run ahead of the same July period to the extent of about 10 per cent. Major line pipe orders for this year's installation are about completed but prospects for line pipe for lateral lines remains promising.

Jones & Laughlin Steel Corp. has been awarded 500 tons of various sizes of pipe up to 12 in. for a section of the Circumferential Parkway in Brooklyn.

RAILROAD BUYING

. . . Outlook brightens with 7000 freight cars pending

WITH close to 7000 freight cars pending which would utilize approximately 80,000 to 84,000 tons of steel, prospects for railroad buying are becoming brighter. This estimate does not include the likelihood of New York Central inquiring for 5000 cars, which in all probability would utilize between 60,000 and 64,000 tons of steel. There is a chance that the Chesapeake & Ohio inquiry for 2500 cars may break the ice this week and may portend firm contracts on other pending inquiries. The C. & O. has issued inquiries for 2000 50-ton hopper coal cars, 400 50-ton low side drop end gondola cars with steel floors and 100 50-ton low side drop end gondolas with wooden floors. Bids close at Cleveland at 10 a. m. Monday, Sept. 11. The Chicago & North Western has issued new inquiries to car builders for the 800 cars that have been under consideration for some time and the New Haven Railroad is in the market for 200 freight cars.

Meanwhile, the Norfolk Southern has asked authority to issue $607,000 in equipment trust certificates to purchase five freight locomotives to be built by the Baldwin Locomotive Works at a cost of $675,000. The Apalachicola Northern Railroad has made application for an $800,000 RFC loan, funds from which would be distributed partly as follows: $25,000 for five miles of 80 to 90-lb. relay rails, $20,000 for improvements and betterments to bridge structures and $25,000 for machine tools and shop equipment. The Iranian government proposes to purchase equipment including locomotives, shunting engines, freight cars and special coaches.

American Car & Foundry Co. and Pressed Steel Car Co. were low on a joint bid to Board of Transportation, New York, covering 150 passenger cars for subway service, with option on 100 to 150 additional cars.

Baldwin Locomotive Works and subsidiary companies booked orders amounting to $4,017,421 in July, a gain of 136 per cent over July, 1938. For the first seven months, the group received orders totaling $32,486,522 as compared with $15,042,021 in the corresponding period of a year ago.

MERCHANT BARS

. . . August tonnage may be lower at Cleveland

WHILE merchant bar orders up to Aug. 28 at CLEVELAND were holding at the volume received in the comparable part of July, sellers anticipated that August would fall below the preceding month because of the fact heavy tonnages featured the last week of July. Hot rolled bar sales at PITTSBURGH in the past week are no less diversified than a week ago. Some additional support has materialized from automobile companies with prospects of further gains from this source

anticipated in the near future. Despite the fact that the latter part of July reflected an increase in bar demand bookings so far this month continue to exceed the volume placed in the same period in July.

BOLTS, NUTS AND RIVETS

. . . Month biggest of year for cap screw makers

ORDERS at CLEVELAND started slackening about ten days ago, but August aggregate business is generally good in comparison to July. Consumer inventories are still low. Contrary to all guesses, August is described as the biggest month of the year for cap screw manufacturers at CLEVELAND. The buying has been from all sources, including jobbers, customers out of the market for several months, and automotive. Rivet manufacturers in the CLEVELAND district expect an active fall due to increased railroad car building, and shipbuilding.

STRUCTURAL STEEL

. . . Awards slightly lower at 13,000 tons; new projects hold

AWARDS the past week were slightly lower at 13,000 tons, compared with 16,450 tons a week ago, the outstanding new contracts being 1600 tons for a Long Island Railroad grade elimination, 1455 tons for a mill for the Champion Paper & Fiber Co., Pasadena, Tex., and 1400 tons for a viaduct and approaches at Providence, R. I.

Leading inquiries this week include 1700 tons for Hills Bros. Coffee Co. buildings, Edgewater, N. J., 5000 tons for a New England Mutual Life Insurance Co. building at Boston, and 3600 tons for a power house extension for the Public Service Electric & Gas Co. of Burlington, N. J. There continues to be further evidence of an increase in privately financed projects. Structural specifications at PITTSBURGH reflect little or no decline from a week ago and orders so far this month continue ahead of the corresponding July period.

REINFORCING STEEL

. . . Awards total 8900 tons; housing project takes 2900

CONTRACTS placed the past week call for 8900 tons, including 2900 tons for a housing project at CHICAGO, 1800 tons for the All American Canal at Niland, Cal., and 1240 tons for a municipal light plant at CLEVELAND.

At PITTSBURGH concrete bar specifications are substantially ahead of the same period of July and producers look for a continuation of recent activity. With the approach of fall, lettings of highway work in EASTERN PENNSYLVANIA are slowing up, although considerable tonnage is yet to be placed by contractors on old projects. Of outstanding interest at CLEVELAND is the award of 1240 tons for the Cleveland municipal light plant, placed with Carnegie-Illinois Steel Corp., through Lombardo Brothers Construction Co. A 1063-ton sewage treatment plant in Hammond, Ind., and a 1000-ton reservoir in Grand Rapids, Mich., were added to the Chicago district inquiry list this week, which now totals about 12,000 tons. Included in this figure are three sections of the Chicago subway and a Montgomery Ward mail order building.

The Bureau of Reclamation has readvertised bids on 1337 tons reinforcing bars for the Central Valley project, Pollock, Cal., for Sept. 7.

. . . STEEL EXPORTS . . .

. . . Shipments down 23,370 tons in July; scrap also declines.

EXPORTS of iron and steel products in July declined 26,370 gross tons to 163,598 tons from 189,960 tons in June while the outgoing movement of scrap recorded a drop of 48,822 tons to 350,066 tons from 398,888 tons. The sharpest decrease in iron and steel exports was made in plain plates, whose July total was 13,930 tons compared with 25,507 tons in June. The principal foreign markets for July scrap exports were: Japan, 121,012 tons; United Kingdom, 99,833 tons; Italy, 50,170 tons; Poland, 37,044 tons; Canada, 15,702 tons and the Netherlands, 12,612 tons.

TIN PLATE

. . . Shipments, production unchanged at Pittsburgh

TIN plate operations this week at PITTSBURGH remain at 66 per cent of capacity with new business and shipments practically unchanged from a week ago. General line can business continues its slow expansion.

. . . GREAT BRITAIN . . .

. . . Active operations continue under shadow of war threats.

LONDON, Aug. 29 (*By Cable*)—The British iron and steel market is naturally under the shadow of war threats, but active operations continue though some commercial buyers are temporarily holding off. Meanwhile defense departments are pressing for deliveries and the government is ready to enforce the system of priorities.

The general situation is unchanged, with steel works extremely busy in all parts of the country. The question of maintenance of adequate supplies of imported iron ore is receiving close attention here, with no likelihood of a shortage of coke. Pressure for supplies of all kinds of steel is intense. Ingot production is now at a maximum, but large quantities of foreign semi-finished steel are being imported, including sheet bars from Australia. Galvanized sheet mills are working at top pressure on air raid shelters. Big rail contracts have been booked for China.

Weekly Bookings of Construction Steel

	Week Ended				Year to Date	
	Aug. 29, 1939	Aug. 22, 1939	Aug. 1, 1939	Aug. 30, 1938	1939	1938
Fabricated structural steel awards	13,000	16,450	25,150	21,600	665,575	*492,225
Fabricated plate awards	950	1,390	4,130	4,410	110,830	95,900
Steel sheet piling awards	1,200	1,065	270	500	46,105	29,235
Reinforcing bar awards	8,900	6,610	8,450	5,525	315,660	209,445
Total Letting of Construction Steel..	24,050	25,515	38,000	32,035	1,138,170	826,805

*Revised.

IRON AND STEEL SCRAP

AUG. 29—The continued scarcity of No. 1 steel in eastern Pennsylvania has resulted in a 50c. advance in quotation on that grade at Philadelphia, but at no other point have mill sales or broker-dealer transactions justified an increase in the price of No. 1 heavy melting. In fact, at St. Louis, where several large mill transactions have taken place in the last few days, dealers' buying prices on No. 1 have declined 50c. In most markets, on the other hand, a strong undertone is observed, with both buyers and sellers sitting on the sidelines awaiting developments abroad. A tight situation in supplies exists at many points and any extensive mill buying should send prices upward. No. 2 steel has been moved up 50c. at Pittsburgh on this basis. Cast grades, particularly No. 1 cupola cast, are also being marked up in several districts. On the basis of the change in No. 1 steel at Philadelphia, the composite price is up 16c. to $15.62, new high this year.

For shipment out of Port Richmond, Philadelphia brokers have upped their buying prices on export scrap in conformity with the stronger domestic market, but the whole export situation as regards both the Far East and Europe is temporarily hamstrung by restrictions on shipping, following withholding of practically all new chartering until the European crisis resolves itself.

Pittsburgh

The market continues expectant and strong. Brokers are still paying $16 and slightly more in some cases for No. 1 heavy melting steel. Secondary grades are becoming more scarce and as a result No. 2 heavy melting steel is quotable this week at $14.50 to $15, up 50c. from a week ago. Quotation on No. 1 heavy melting remains unchanged at $16 to $16.50. The balance between supply and demand is so thin that a moderate sized sale into consumption could easily upset the current equilibrium.

Chicago

This market continues deadlocked with dealers demanding from brokers practically the same amount as the only important district buyer is willing to pay, namely, $14 a gross ton delivered for No. 1 steel. The $13.75 buying price has disappeared almost entirely, but a car now and then still can be picked up for less than $14. The Burlington railroad withdrew its list last week without selling, holding out reportedly for $13 net or $15.40 gross delivered. Even the $14 price is not bringing out material easily, but it is believed that any price over that would obtain as much scrap as would be desired.

Philadelphia

The continued scarcity of supplies in this district has pushed up quotations on No. 1 steel another 50c. to $16.50 to $17, several moderate tonnages having been bought at this top figure in the past week. No. 2 steel remains unchanged at a flat $14.50 as district mills still find it possible to obtain tonnages at this figure. Recent sales of heavy breakable cast have been made at both $16 and $16.50. Most Eastern Pennsylvania mills are fairly well covered on steel making grades, with at least one interest acting to slow up shipments. Competition among brokers for export material has resulted in as high as $16 being paid for No. 1 and $14.75 for No. 2 on several occasions, making these grades now quotable at $15.75 to $16 and $14.50 to $14.75 respectively, up an average of 25c. The Pennsylvania list, which closes on Sept. 7, totals 19,620 tons, with about 5000 tons being No. 1 steel.

Youngstown

For the long term outlook dealers are optimistic, but this week the market started out quiet, with regulations still in force at Warren. Occasionally dealers have paid slightly more than published quotations for small lots of scrap, leading to the likelihood that possibly printed prices may be on the low side when finally tested by purchases of 25,000 or more tons.

Cleveland

Despite the lack of mill buying recently, the market contains a strong undertone here, evidenced during the past week when some brokers offered as high as $14.75 per ton for single cars of No. 1 heavy melting. Delegates to the meeting of the Scrap Institute here brought similar word from other districts. Some voiced the opinion they would rather go long than short right now. Orders at some local consuming points are nearing an end. Meanwhile, the monthly railroad lists are coming out moderate in size. Scrapping of the Toledo and Indiana electric railroad is anticipated soon.

Buffalo

No sales are reported this week and the market at present is marking time. There is a temporary hold-up of shipments at one mill, which is expected to be of short duration. Some small sales of cast scrap have been made. With the additional increase in operations dealer sentiment for the future is good.

St. Louis

One East Side mill purchased 10,000 tons and another 5000 tons of heavy melting steel, also 1000 tons of cast scrap. The price paid by the first mill was $12 per ton, the same as the last previous purchase 10 days ago. The second mill paid $12.50, or 50c. higher than the preceding buy of the same material. Delivery over 60 days is specified in both deals. The $12 price has brought out somewhat freer offerings from the country and elsewhere, and the market continues very strong, particularly on the grades involved in the latest sales, although buying prices have receded. Great uncertainty exists in the trade because of the European situation, and there is a disposition to sit tight on the part of both buyers and sellers. Railroad lists included 2580 tons by Chicago, Milwaukee & St. Paul and 19,260 tons by the Pennsylvania Railroad, very little of which is likely to come to this center.

Cincinnati

The scrap market is in a watchful mood. While the moderately strong undertone continues to support current prices, the war scares in Europe tend to enforce caution upon dealers generally. As a result they are watchfully waiting present events and in the meantime a greater portion of activity is confined to dealer efforts to improve their position against anticipated improved business during the third quarter. Prices are unchanged.

New York

The European crisis has cast uncertainty over the export market as a result of constrictions on shipping. Withholding of ships of British registry and like action on the part of other nations has not only put a halt to future shipments to Europe, but has also made it impossible for the Japanese to take out any large shipments in the immediate future. Japanese vessels have been carrying only odd tonnages, the big tonnages having all been shipped to Japan in foreign bottoms in the past. Ships now in port are still being loaded as letters of credit have been established for the cargoes, leaving no risk for the exporters. Buying prices in the face of this uncertain situation are unchanged.

Boston

European political developments the past week made for great uncertainty in the export market. With war risk rates skyrocketing, the available supply of steamers shrunk materially. None the less, scrap prices are very strong. Exporters openly quote $14 to $14.25 a ton delivered dock on No. 1 steel, but intimate they would pay more for large tonnages. No. 2 steel is openly quoted at $13 to $13.25 a ton delivered, up 25c. a ton on the outside. Japan has orders out in this market for round tonnages, but exporters say it is quite doubtful if the orders are filled. For eastern Pennsylvania shipment regular steel turnings have advanced from $4.65 a ton on cars to $4.90, and short shoveling turnings are now up to $5.15 a ton on cars. The $3.88 a ton on cars price for Pittsburgh district delivery eliminates shipments there. Breakable cast and stove plate are in demand for domestic and export use, but prices are unchanged.

Toronto

In the iron and steel scrap markets conditions generally are unchanged although there has been minor betterment in sales in the past few days. Steel mills continue to place short term contracts with no advance in bid prices and there is steady movement of heavy melting steel to the Hamilton area. Foundries are in the market for cast scrap. No. 1 machinery cast is scarce and consumers are obtaining most of their supplies direct from the railroads, while No. 2 grade, most of which is obtained from automobile wrecking, is sufficient to take care of demands. Other materials are still moving in a sluggish manner, but consumers are watching the market with more interest in the event of war, which would immediately create both higher prices for scrap as well as a general uplift in demand.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.00 to 16.50
Railroad hvy. mltng.	17.00 to 17.50
No. 2 hvy. mltng. steel	14.50 to 15.00
Scrap rails	17.00 to 17.50
Rails 3 ft. and under	19.00 to 19.50
Comp. sheet steel	16.00 to 16.50
Hand bundled sheets	15.00 to 15.50
Hvy. steel axle turn.	14.50 to 15.00
Machine shop turn.	10.00 to 10.50
Short shov. turn.	12.50 to 13.50
Mixed bor. & turn.	9.25 to 9.75
Cast iron borings	9.25 to 9.75
Cast iron carwheels	15.50 to 16.00
Hvy. breakable cast	13.00 to 13.50
No. 1 cupola cast	15.75 to 16.25
RR. knuckles & cplrs.	18.50 to 19.00
Rail coil springs	20.00 to 20.50
Rail leaf spring	19.00 to 19.50
Rolled steel wheels	19.00 to 19.50
Low phos. billet crops	20.00 to 20.50
Low phos. punchings	18.50 to 19.00
Low phos. plate (heavy)	18.50 to 19.50
Railroad malleable	16.50 to 17.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$16.50 to $17.00
No. 2 hvy. mltng. steel	14.50
Hydraulic bund., new	16.00 to 16.50
Hydraulic bund., old	12.50 to 13.00
Steel rails for rolling	17.00 to 17.50
Cast iron carwheels	16.00 to 16.50
Hvy. breakable cast	16.00 to 16.50
No. 1 cast	16.50 to 17.00
Stove plate (steel wks.)	13.50 to 14.00
Railroad malleable	16.00 to 17.00
Machine shop turn.	9.00 to 9.50
No. 1 blast furnace	6.50 to 7.00
Cast borings	6.50 to 7.00
Heavy axle turnings	10.50 to 11.00
No. 1 low phos. hvy.	17.50 to 18.00
Couplers & knuckles	17.50 to 18.00
Rolled steel wheels	17.50 to 18.00
Steel axles	20.00 to 20.50
Shafting	20.50 to 21.00
Spec. iron & steel pipe	13.00 to 13.50
No. 1 forge fire	12.00 to 12.50
Cast boring (chem.)	9.50 to 10.00

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$13.75 to $14.00
Auto. hvy. mltng. steel alloy free	12.50 to 13.00
No. 2 auto steel	11.00 to 11.50
Shoveling steel	13.75 to 14.00
Factory bundles	12.75 to 13.25
Dealers' bundles	11.75 to 12.25
Drop forge flashings	10.00 to 10.50
No. 1 busheling	12.50 to 13.00
No. 2 busheling, old	5.75 to 6.25
Rolled carwheels	14.50 to 15.00
Railroad tires, cut	15.00 to 15.50
Railroad leaf springs	14.50 to 15.00
Steel coup. & knuckles	14.50 to 15.00
Axle turnings	12.50 to 13.00
Coil springs	16.50 to 17.00
Axle turn. (elec.)	13.50 to 14.00
Low phos. punchings	15.50 to 16.00
Low phos. plates 12 in. and under	15.00 to 15.50
Cast iron borings	6.50 to 7.00
Short shov. turn.	6.50 to 7.00
Machine shop turn.	6.50 to 7.00
Rerolling rails	18.00 to 18.50
Steel rails under 3 ft.	16.00 to 16.50
Steel rails under 2 ft.	16.50 to 17.00
Angle bars, steel	15.50 to 16.00
Cast iron carwheels	12.50 to 13.00
Railroad malleable	15.00 to 15.50
Agric. malleable	12.00 to 12.50

	Per Net Ton
Iron car axles	$18.00 to $18.50
Steel car axles	17.50 to 18.00
Locomotive tires	13.00 to 13.50
Pipes and flues	8.50 to 9.00
No. 1 machinery cast	12.00 to 12.50
Clean auto. cast	12.50 to 13.00
No. 1 railroad cast	11.00 to 11.50
No. 1 agric. cast	10.00 to 10.50
Stove plate	7.75 to 8.25
Grate bars	7.75 to 8.25
Brake shoes	9.50 to 10.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$15.25 to $15.75
No. 2 hvy. mltng. steel	14.25 to 14.75
Low phos. plate	16.50 to 17.00
No. 1 busheling	14.25 to 14.75
Hydraulic bundles	14.75 to 15.25
Machine shop turn.	9.00 to 9.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$14.50 to $15.00
No. 2 hvy. mltng. steel	13.50 to 14.00
Comp. sheet steel	14.25 to 14.75
Light bund. stampings	11.00 to 11.50
Drop forge flashings	12.50 to 13.00
Machine shop turn.	8.00 to 8.50
Short shov. turn.	8.50 to 9.00
No. 1 busheling	13.50 to 14.00
Steel axle turnings	10.50 to 11.00
Low phos. billet and bloom crops	18.50 to 19.00
Cast iron borings	8.50 to 9.00
Mixed bor. & turn.	8.50 to 9.00
No. 2 busheling	8.50 to 9.00
No. 1 cupola cast	16.50 to 17.00
Railroad grate bars	11.00 to 11.50
Stove plate	9.50 to 10.00
Rails under 3 ft.	18.50 to 19.00
Rails for rolling	18.25 to 18.75
Railroad malleable	16.50 to 17.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$14.50 to $15.00
No. 2 hvy. mltng. steel	12.50 to 13.00
Scrap rails	15.50 to 16.00
New hvy. b'ndled sheets	13.00 to 13.50
Old hydraul. bundles	11.50 to 12.00
Drop forge flashings	12.50 to 13.00
No. 1 busheling	12.50 to 13.00
Machine shop turn.	8.00 to 8.50
Shov. turnings	9.50 to 10.00
Mixed bor. & turn.	8.00 to 8.50
Cast iron borings	8.00 to 8.50
Knuckles & couplers	16.00 to 16.50
Coil & leaf springs	16.00 to 16.50
Rolled steel wheels	16.00 to 16.50
No. 1 machinery cast	15.00 to 16.00
No. 1 cupola cast	14.50 to 15.00
Stove plate	12.00 to 12.50
Steel rails under 3 ft.	18.50 to 19.00
Cast iron carwheels	14.50 to 15.00
Railroad malleable	15.00 to 15.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting	$12.00 to $12.50
No. 1 hvy. melting	12.25 to 12.75
No. 2 hvy. melting	11.75 to 12.25
No. 1 locomotive tires	13.25 to 13.75
Misc. stand. sec. rails	14.50 to 15.00
Railroad springs	15.00 to 15.50
Bundled sheets	8.00 to 8.50
No. 1 busheling	7.50 to 8.00
Cast. bor. & turn.	3.00 to 3.50
Machine shop turn.	4.50 to 5.00
Heavy turnings	9.00 to 9.50
Rails for rolling	16.50 to 17.00
Steel car axles	18.50 to 19.00
No. 1 RR. wrought	9.75 to 10.25
No. 2 RR. wrought	12.00 to 12.50
Steel rails under 3 ft.	15.50 to 16.00
Steel angle bars	13.50 to 14.00
Cast iron carwheels	14.75 to 15.25
No. 1 machinery cast	15.00 to 15.50
Railroad malleable	12.50 to 13.00
No. 1 railroad cast	12.50 to 13.00
Stove plate	7.50 to 8.00
Grate bars	8.00 to 8.50
Brake shoes	9.50 to 10.00

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel	$11.50 to $12.00
No. 2 hvy. mltng. steel	9.25 to 9.75
Scrap rails for mltng.	15.00 to 15.50
Loose sheet clippings	7.00 to 7.50
Hydrau. b'ndled sheets	11.00 to 11.50
Cast iron borings	3.50 to 4.00
Machine shop turn.	4.75 to 5.25
No. 1 busheling	7.50 to 8.00
No. 2 busheling	2.50 to 3.00
Rails for rolling	17.00 to 17.50
No. 1 locomotive tires	13.50 to 14.00
Short rails	17.75 to 18.25
Cast iron carwheels	12.75 to 13.25
No. 1 machinery cast	12.75 to 13.25
No. 1 railroad cast	12.50 to 13.00
Burnt cast	6.75 to 7.25
Stove plate	6.75 to 7.25
Agricul. malleable	11.00 to 11.50
Railroad malleable	13.50 to 14.00
Mixed hvy. cast	11.25 to 11.75

BIRMINGHAM

Per gross ton delivered to consumer:

Hvy. melting steel	$13.00
Scrap steel rails	$13.50 to 14.00
Short shov. turnings	7.50
Stove plate	9.50
Steel axles	18.50
Iron axles	18.50
No. 1 RR. wrought	10.00
Rails for rolling	16.00 to 16.50
No. 1 cast	15.00
Tramcar wheels	14.50 to 15.00

DETROIT

Dealers' buying prices per gross ton:

No. 1 hvy. mltng. intrial steel	$11.00 to $11.50
No. 2 hvy. mltng. steel	10.00 to 10.50
Borings and Turnings	5.75 to 6.25
Long turnings	5.75 to 6.75
Short shov. turnings	6.50 to 7.00
No. 1 machinery cast	13.00 to 13.50
Automotive cast	13.50 to 14.00
Hvy. breakable cast	9.50 to 10.00
Stove plate	8.00 to 8.50
Hydraul. comp. sheets	12.50 to 13.00
New factory bushel	11.00 to 11.50
Sheet clippings	8.25 to 9.25
Flashings	10.50 to 11.00
Low phos. plate scrap	12.00 to 12.50

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel	$11.50 to $12.00
No. 2 hvy. mltng. steel	9.00 to 9.50
Hvy. breakable cast	12.00 to 12.50
No. 1 machinery cast	11.50 to 12.00
No. 2 cast	9.50 to 10.00
Stove plate	9.50 to 10.00
Steel car axles	15.00 to 15.50
Shafting	15.00 to 15.50
No. 1 RR. wrought	11.00 to 11.50
No. 1 wrought long	9.50 to 10.00
Spec. iron & steel pipe	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Clean steel turnings*	4.50 to 5.00
Cast borings*	3.50 to 4.00
No. 1 blast furnace	3.50 to 4.00
Cast borings (chem.)	9.50 to 10.00
Unprepared yard scrap	6.00 to 6.50
Light iron	3.00 to 3.50
Per gross ton, delivered local foundries:	
No. 1 machn. cast†	$13.50 to $14.00
No. 2 cast†	10.50 to 11.00

* $1.50 less for truck loads.
† Northern N. J. prices are $2 to $2.50 higher.

BOSTON

Dealers' buying prices per gross ton:

Breakable cast	$10.50 to $10.75
Machine shop turn.	4.90 to 5.15
Mixed bor. & turn.	2.25
Bun. skeleton long	8.00 to 8.15
Shafting	16.15
Cast bor. chemical	5.00 to 6.00
Per gross ton delivered consumers' yards	
Textile cast	$14.00 to $14.50
No. 1 machine cast	13.50 to 14.50
Per gross ton delivered dealers' yards:	
No. 1 hvy. mltng. steel	$12.00 to $12.50
No. 2 steel	10.50 to 11.00

PACIFIC COAST

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$13.00 to $13.50
No. 2 hvy. mltng. steel	12.50 to 13.00

CANADA

Dealers' buying prices at their yards, per gross ton:

	Toronto	Montreal
No. 1 hvy. mltng. steel	$9.25	$8.75
No. 2 hvy. mltng. steel	8.00	7.50
Mixed dealers steel	6.75	6.25
Drop forge flashings	8.25	7.75
New loose clippings	4.25	3.75
Busheling	3.75	3.25
Scrap pipe	4.25	3.75
Steel turnings	4.25	3.75
Cast borings	3.75	3.25
Machinery cast	14.00	13.50
Dealers cast	12.00	11.50
Stove plate	8.00	7.50

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barge:

No. 1 hvy. mltng. steel	$12.50 to $13.00
No. 2 hvy. mltng. steel	11.00 to 11.50
No. 2 cast	10.50 to 11.00
Stove plate	9.50 to 10.00

Boston on cars at Army Base or Mystic Wharf:

No. 1 hvy. mltng. steel	$14.00 to $14.25
No. 2 hvy. mltng. steel	13.00 to 13.25
Rails (scrap)	14.00 to 14.25

Philadelphia, delivered alongside boats, Port Richmond:

No. 1 hvy. mltng. steel	$15.75 to $16.00
No. 2 hvy. mltng. steel	14.50 to 14.75

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher. F.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Gross Ton
Pittsburgh, Chicago or Cleveland	$43.00
Worcester, Mass.	45.00
Birmingham	43.00
San Francisco	52.00

Rods over 9/32 in. or 47/64 in., inclusive, $5 a ton over base.

SOFT STEEL BARS

	Base per Lb.
Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham	2.15c.
Detroit, delivered	2.25c.
Duluth	2.25c.
Philadelphia, delivered	2.47c.
New York	2.49c.
On cars dock Gulf ports	2.50c.
On cars dock Pacific ports	2.75c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.00c.
On cars dock Tex. Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt.	1.90c.
Detroit, delivered	2.00c.
On cars dock Tex. Gulf ports	2.25c.
On cars dock Pacific ports	2.35c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributers)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham	1.80c.
Detroit, delivered	1.90c.
On cars dock Tex. Gulf ports	2.15c.
On cars dock Pacific ports	2.25c.

IRON BARS

Chicago and Terra Haute	2.15c.
Pittsburgh (refined)	3.60c.

COLD FINISHED BARS AND SHAFTING*

Pittsburgh, Buffalo, Cleveland, Chicago, and Gary	2.65c.
Detroit	2.70c.

* In quantities of 10,000 to 19,999 lb.

PLATES

	Base per Lb.
Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del.	2.10c.*
Philadelphia, del'd	2.05c. to 2.15c.
New York, del'd	2.19c. to 2.29c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.60c.
Wrought iron plates, P'tg	3.80c.

* Subject to concessions, particularly in the East, of $2 a ton.

FLOOR PLATES

Pittsburgh or Chicago	3.35c.
New York, del'd	3.71c.
On cars dock Gulf ports	3.70c.
On cars dock Pacific ports	3.95c.

STRUCTURAL SHAPES

	Base per Lb.
Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham	2.10c.
Philadelphia, del'd	2.215c.
New York, del'd	2.27c.
On cars dock Gulf ports	2.45c.
On cars dock Pacific ports	2.70c.

STEEL SHEET PILING

	Base per Lb.
Pittsburgh, Chicago or Buffalo	2.40c.
On cars dock Gulf ports	2.85c.
On cars dock Pacific ports	2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton	$40.00
Angle bars, per 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton	$40.00
Light rails (from rail steel) per gross ton	39.00

	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast ports	2.25c.
Track bolts, to steam railroads	4.15c.
Track bolts to jobbers, all sizes (per 100 counts)	65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

SHEETS

Hot Rolled

	Base per Lb.
Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago	2.00c.
Detroit, delivered	2.10c.
Philadelphia, delivered	2.17c.
Granite City	2.10c.
On cars dock Pacific ports	2.50c.
Wrought iron, Pittsburgh	4.10c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago	3.05c.
Detroit, delivered	3.15c.
Granite City	3.15c.
Philadelphia, delivered	3.37c.
On cars dock Pacific ports	3.65c.

* Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base.

From May 10 up to and including May 15, reductions from the base price of hot and cold rolled sheets running from $4 to $8 a ton were prevalent. Concessions withdrawn, on May 15.

Subsequent to May 15, many orders originally placed at $4 to $6 below the base price were adjusted to the full $8 concession.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham	3.50c.
Philadelphia, delv'd	3.67c.
Granite City	3.60c.
On cars dock Pacific ports	4.00c.
Wrought iron, Pittsburgh	6.10c.

Electrical Sheets

(F.o.b. Pittsburgh)

	Base per Lb
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.55c.
Transformer 52	8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c per 100 lb. for coils. Pacific ports add 70c. a 100 lb

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary	3.80c.
F.o.b. cars dock Pacific ports	4.50c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland	3.35c.
Detroit, delv'd	3.45c.
Granite City	3.45c.
On cars dock Pacific ports	3.95c.

TIN MILL PRODUCTS

***Tin Plate**

	Per Base Box
Standard cokes, Pittsburgh, Chicago and Gary	$5.00
Standard cokes, Granite City	5.10

* Prices effective Nov. 10 on shipments through first quarter of 1939.

Special Coated Manufacturing Ternes

	Per Base Box
Granite City	$4.40
Pittsburgh or Gary	4.30

Roofing Terne Plate

(F.o.b. Pittsburgh)

(Per Package, 112 sheets, 20 x 28 in.)

8-lb. coating I.C.	$12.00
15-lb. coating I.C.	14.00
20-lb. coating I.C.	15.00
25-lb. coating I.C.	16.00
30-lb. coating I.C.	17.25
40-lb. coating I.C.	19.50

Black Plate, 29 gage and lighter

Pittsburgh, Chicago and Gary	3.05c.
Granite City	3.15c.
On cars dock Pacific ports, boxed	4.00c.

HOT ROLLED STRIP

(Widths up to 12 in.)

	Base per Lb
Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham	2.00c.
Detroit, delivered	2.10c.

Cooperage Stock

Pittsburgh & Chicago	2.10c.

From May 10 up to and including May 15, reductions in the base price of hot rolled strip running from $4 to $8 a ton were prevalent. Concessions withdrawn on May 15.

Subsequent to May 15, many orders originally placed at $4 to $6 below the base price were adjusted to the full $8 concession.

COLD ROLLED STRIP*

	Base per Lb
Pittsburgh, Youngstown or Cleveland	2.80c.
Chicago	2.90c.
Detroit, delivered	2.90c.
Worcester	3.00c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland	2.95c.
Detroit, delivered	3.05c.
Worcester	3.35c.

From May 10 up to and including May 15, reductions from the base price of cold rolled strip amounting to $4 a ton were prevalent. Concessions withdrawn on May 15.

COLD ROLLED SPRING STEEL

		Pittsburgh and Cleveland	Worcester
Carbon	0.26-0.50%	2.80c.	3.00c.
Carbon	0.51-0.75	4.30c.	4.50c.
Carbon	0.76-1.00	6.15c.	6.35c.
Carbon	1.01-1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

	Per Lb.
Bright wire	2.60c.
Galvanized wire, base	2.65c.*
Spring wire	3.20c.

* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

To the Trade

	Base per Keg
Standard wire nails	$2.40
Coated nails	2.40
Cut nails, carloads	3.60

	Base per 100 Lb.
Annealed fence wire	$2.90
Galvanized fence wire	3.30
Polished staples	3.10
Galvanized staples	3.35
Twisted barbless wire	3.25
Woven wire fence, base column	.67
Single loop bale ties, base col	.56
Stand. 2 pt., 12.5 gage barbed cattle wire, per 80 rod spool	$2.58
Stand. 2 pt., 12.5 gage barbed hog wire, per 80 rod spool	$2.76

Note: Birmingham base same on above items, except spring wire.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel			*Wrought Iron*		
In.	Black	Galv.	In.	Black	Galv.
⅛	.56	36	¼ & ⅜	.+9	+30
¼ to ⅜	.59	43½	½	.24	6½
½	.63½	54	¾	.30	13
¾	.66½	60½	1 & 1¼	.34	19
1 to 3	.68½	60½	1½	.38	21½
			2	.37½	21

Lap Weld

⅜	.61	52½	2	.30½	15
2½ & 3	.64	55½	2½ to 3½	31½	17½
3½ to 6.66		57½	4	.33½	21
7 & 8.65		55½	4½ to 8.32	½	20
9 & 10.64	½	55	9 to 12	.28½	15
11 & 12.63	½	54			

Butt weld, extra strong, plain ends

⅛	.54½	41½	¼ & ⅜	.+10	+43
½ to ⅜	.56½	45½	½	.25	9
½	.61½	37½	¾	.31	15
¾	.65½	57½	1 to 2	.38	22½
1 to 3	.67	60			

Lap weld, extra strong, plain ends

2	.59	51½	2	.33½	18½
2½ & 3	.63	55½	2½ to 4.39	½	25½
3½ to 6.66	½	59	4½ to 6.37	½	24
7 & 8.65	½	56	7 & 8	.38½	24½
9 & 10.64	½	55	9 to 12	.32	20½
11 & 12.63	½	54			

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount of $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld Hot Rolled
1 in. o.d. .13 B.W.G.	$ 9.01	$ 7.82	....
1¼ in. o.d. .13 B.W.G.	10.67	9.26	....
1½ in. o.d. .13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d. .13 B.W.G.	13.42	11.64	11.06
1 in. o.d. .13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d. .13 B.W.G.	16.76	14.54	13.79
2½ in. o.d. .12 B.W.G.	18.45	16.01	15.16
2¾ in. o.d. .12 B.W.G.	20.21	17.54	16.58
3 in. o.d. .12 B.W.G.	21.42	18.59	17.54
3¼ in. o.d. .12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. .11 B.W.G.	28.37	24.62	23.15
4 in. o.d. .10 B.W.G.	35.20	30.54	28.66
4½ in. o.d. .10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.98	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	30%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	45%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago	$51.00
6-in. and larger, del'd New York	49.00
*6-in. and larger, Birmingham	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles	52.00
F.o.b dock, Seattle	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, $3 extra 4-in. pipe is $3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $42, Birmingham, and $5 delivered Chicago and 4-in. pipe, $45, Birmingham, and $54 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:	
½ in. and 6 in. and smaller	68½
Larger and longer up to 1 in.	66
1⅛ in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
½ in. and smaller	67
9/16 in. to 1 in. inclusive	64
1⅛ in. and larger	62

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

	U.S.S.	S.A.E.
Semi-fin. hexagon nuts		
½ in. and smaller	67	70
9/16 to 1 in.	64	65
1⅛ in. and larger	62	62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, nuts attached	72½
Stove bolts in packages, with nuts separate	72½ and 12½
Stove bolts in bulk	84

On stove bolts freight is allowed to destination on 200 lb. and over.

Large Rivets

(½ in. and larger)

Base Per 100 Lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham $3.40

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland Chicago, Birmingham ...65 and 10

Cap and Set Screws

(Freight allowed to destination)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¾ in. and smaller	70
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	75
Upset set screws, cup and oval points	77½
Milled studs	60

Alloy Steel

Alloy Steel Blooms, Billets and Slabs

F.ob. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem. Base price, $56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base	2.70c.
Delivered, Detroit	2.80c.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
2100 (1½% Nickel)	$0.75
2300 (3½% Nickel)	1.55
2500 (5% Nickel)	2.25
3100 Nickel-chromium	0.70
3200 Nickel-chromium	1.85
3300 Nickel-chromium	3.80
3400 Nickel-chromium	3.30
4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)	0.55
4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)	0.75
4340 Chr.-Ni.-Mo.	1.65
4345 Chro.-Ni.-Mo.	1.55
4600 Nickel - molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)	1.10
5100 Chrome steel (0.60-0.90 Cr.)	0.35
5100 Chrome steel (0.80-1.10 Cr.)	0.45
6100 Chromium spring steel	0.15
6100 Chromium-vanadium bar	1.20
6100 Chromium-vanadium spring steel	0.85
Chromium-nickel vanadium	1.50
Carbon-vanadium	0.85

These prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

F.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. base per lb. Delivered Detroit, 3.45c., carlots

STAINLESS & HEAT RESISTANT ALLOYS

(Base prices, cents per lb. f.o.b. Pittsburgh)

Chrome-Nickel

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25c.	24c.
Plates	29c.	27c.
Structural shapes	25c.	24c.
Sheets	36c.	34c.
Hot-rolled strip	23.50c.	21.50c.
Cold-rolled strip	30c.	28c.
Drawn wire	25c.	24c.

Straight Chrome

	No. 410	No. 430	No. 442	No. 446
Bars	18.50c.	19c.	22.50c.	27.50c.
Plates	21.50c	22c.	25.50c.	30.50c.
Sheets	26.50c.	29c.	32.50c.	36.50c.
Hot strip	17c.	17.50c.	24c.	35c.
Cold strip	22c.	22.50c.	32c.	52c.

TOOL STEEL

High speed	67c.
High-carbon-chrome	43c.
Oil-hardening	21c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

British and Continental

BRITISH

Per Gross Ton
f.o.b. United Kingdom Ports

Ferromanganese, export	Nominal
Tin plate, per base box	20s. 3d. to 21s.
Steel bars, open hearth	£10 8s.
Beams, open hearth	£10
Channels, open hearth	£10 5s.
Angles, open-hearth	£10
Black sheets, No. 24 gage	£13
Galvanized sheets, No. 24 gage	£15 15s.

CONTINENTAL

Per Gross Ton, Gold £, f.o.b. Continental Ports

Billets, Thomas	Nominal
Wire rods, No. 5 B.W.G.	£5 10s.
Steel bars, merchant	£5 5s.
Sheet Bars	Nominal
Plate ¼ in. and up	£5 7s.
Plate 3/16 in. and 5 mm.	£5 13s.
Sheet ⅛ in.	£5 9s. 6d.
Beams, Thomas	£4 18s.
Angles (Basic)	£4 18s.
Hoops and strip, base	£5 12s.

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	$22.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	22.00
Delivered Brooklyn	24.50
Delivered Newark or Jersey City	23.53
Delivered Philadelphia	22.84
F.o.b. Neville Island, Erie, Pa. Toledo, Chicago, Granite City, Cleveland and Youngstown	21.00
F.o.b. Buffalo	21.00
F.o.b. Detroit	21.00
Southern, delivered Cincinnati	21.06
Northern, delivered, Cincinnati	21.44
F.o.b. Duluth	21.50
F.o.b. Provo, Utah	19.00
Delivered, San Francisco, Los Angeles or Seattle	24.50
F.o.b. Birmingham*	17.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	$21.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	21.50
F.o.b. Buffalo	20.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	20.50
Delivered Philadelphia	22.34
Delivered Canton, Ohio	21.89
Delivered Mansfield, Ohio	22.44
F.o.b. Birmingham	16.00

Bessemer

F.o.b. Buffalo	$22.00
F.o.b. Everett, Mass.	23.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	23.00
Delivered Newark or Jersey City	24.53
Erie, Pa., and Duluth	22.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	21.50
F.o.b. Birmingham	22.00
Delivered Cincinnati	22.11
Delivered Canton, Ohio	22.89
Delivered Mansfield, Ohio	23.44

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y.	$26.50

Gray Forge

Valley or Pittsburgh furnace	$20.50

Charcoal

Lake Superior furnace	$25.00
Delivered Chicago	28.34

Canadian Pig Iron

Per Gross Ton

Montreal	
Foundry iron	$24.50 base
Malleable	25.00 base
Basic	24.50 base
Toronto	
Foundry iron	$22.50 base
Malleable	23.00 base
Basic	22.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload)	$80.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%	$28.00
Domestic, 26 to 28%	33.00

Electric Ferrosilicon

Per Gross Ton Delivered; Lump Size

50% (carload lots, bulk)	$69.50*
50% (ton lots in 50 gal. bbl.)	80.50*
75% (carload lots, bulk)	126.00*
75% (ton lots in 50 gal. bbl.)	139.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50%	$30.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50%	$24.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon	10.50c.*
2% carbon	16.50c.*
1% carbon	17.50c.*
0.10% carbon	19.50c.*
0.06% carbon	20.00c.*

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon	$83.00
2.50% carbon	88.00
2% carbon	93.00
1% carbon	103.00

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads	$1.75
Ferrotungsten, 100 lbs. and less	2.00
Ferrovanadium, contract, per lb. contained V., delivered	$2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots	$2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton	$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton	$157.50
Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton	$58.50
Ferrophosphorus, electrolytic, 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville	$75.00
Ferromolybdenum, per lb. Mo. f.o.b. furnace	95c.
Calcium molybdate, per lb. Mo. f.o.b. furnace	80c.
Molybdenum oxide briquettes 48-52% Mo; per lb. contained Mo, f.o.b. Langeloth, Pa.	80c.

* Spot prices are $5 per ton higher.
† Spot prices are 10c. per lb. of contained element higher.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, Bessemer, 51.50%	$5.25
Old range, non-Bessemer, 51.50%	5.10
Messabi, Bessemer, 51.50%	5.10
Messabi, non-Bessemer, 51.50%	4.95
High phosphorus, 51.50%	4.85

Foreign Ore

C.i.f. Philadelphia or Baltimore

Per Unit

Iron, low phos., copper free, 55 to 58% dry, Algeria	12c.
Iron, low phos., Swedish, average, 68½% iron	12c
Iron, basic or foundry, Swedish, aver. 65% iron	10½c.
Iron, basic or foundry, Russian, aver. 65% iron	Nominal
Man., Caucasian, washed 52%	29c
Man., African, Indian, 44-48%	25c.
Man., African, Indian, 49-51%	30c.
Man., Brazilian, 46 to 48%	27c

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered	$18.00
Tungsten, domestic, scheelite delivered	$16.00 to $17.00
Chrome or (lump) c.i.f. Atlantic Seaboard, per gross ton: South African (low grade)	$15.00
Rhodesian, 45%	19.00
Rhodesian, 48%	22.00
Turkish, 48-49%	22.50
Turkish, 45-56%	19.50
Turkish, 40-41%	17.00
Chrome concentrates (Turkish) c.i.f Atlantic Seaboard, per gross ton: 50%	$24.00
48-49%	22.50

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$16.00 to $17.00
Domestic, f.o.b. Ohio River landing barges	$16.50 to 17.50
No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines	$17.00 to 18.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid	21.50
Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	31.50

FUEL OIL

Per Gal.

No. 2, f.o.b. Bayonne, N. J.	4.00c.
No. 6, f.o.b. Bayonne, N. J.	2.50c.
No. 5 Bur. Stds., del'd Chicago	3.25c
No. 6 Bur. Stds., del'd Chicago	2.75c
No. 3 distillate, del'd Cleve'd.	5.375c.
No. 4 industrial, del'd Cleve'd.	5.125c.
No. 5 industrial, del'd Cleve'd.	3.75c
No. 6 industrial, del'd Cleve'd.	3.50c

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, Prompt	$3.75
Foundry, f.o.b. Connellsville, Prompt	$4.75 to 5.50
Foundry, by-product Chicago ovens	10.25
Foundry, by-product, del'd New England	12.50
Foundry, by-product, del'd Newark or Jersey City	10.88 to 11.40
Foundry, by-product, Philadelphia	10.96
Foundry, by-product, delivered Cleveland	10.30
Foundry, by-product, delivered Cincinnati	9.75
Foundry, Birmingham	7.50
Foundry, by-product, del'd St. Louis industrial district	10.75 to 11.00
Foundry, from Birmingham, f.o.b. cars dock Pacific ports	14.75

. . . PIPE LINES . . .

Safford, Ariz., F. B. Jacobson, town clerk, asks bids until Sept. 7 for steel pipe line system for natural gas distribution, comprising 3975 ft. of 8⅝-in.; 8375 ft. of 6⅝-in.; 8420 ft. of 4½-in.; 12,500 ft. of 3½-in., and 45,600 ft. of 2⅜-in., all outside diameter, with alternate bids on mechanical joint cast iron pipe. Also for 58,000 ft. of 1.315-in. o.d., and 1200 ft. of 1.90-in. o.d. steel pipe; seamless steel welding fittings, valves and valve boxes, unions and other fittings; two station regulators, each 40,000 cu. ft. per hr. capacity, with booster equipment; two master gas meters, equipped with integrators, capacity of 20,000 cu. ft. per hr.; 600 domestic gas meters; indicating pressure gages, gas thermometers and miscellaneous apparatus. A. A. Weiland, 902 Central Avenue, is town engineer. Specifications state that no material manufactured outside of United States will be accepted. Engineer noted is head of Weiland Engineering Co., Pueblo, Colo. Fund of $135,000 is available for project through recent bond issue.

Rio Gas & Power Co., Maverick Building, San Antonio, Tex., plans new 3-in. welded steel pipe line from connection with present main system and station at San Angelo, Tex., to Sonora, Tex., about 22 miles, for natural gas distribution at latter point; also installation of distributing lines at Sonora. A similar line will be built from San Angelo to Eldorado, Tex., about 12 miles, for like service, with installation of distributing lines at latter place. Entire project will cost close to $90,000.

Picayune, Miss., plans steel pipe line system for natural gas distribution, including main welded steel pipe line for connection with supply source. S. L. McConnell, Monroe, La., is consulting engineer.

Magnolia Pipe Line Co., Magnolia Building, Dallas, Tex., a subsidiary of Magnolia Petroleum Co., same address, plans new 8-in. welded steel pipe line from point near Vanderbilt, Tex., in oil field area of Jackson County, to connection with present main Mirando-Luling-Beaumont trunk system near Sealy, Austin County, Tex., about 85 miles, for crude oil transmission. Additional steel tank storage and booster pumping station will be installed at latter point. Award for steel pipe for this and other recently announced line of company from Kilgore to Beaumont, Tex., totaling 11,000 tons of 2 to 8-in., has been divided among National Tube Co., Jones & Laughlin Steel Corp., Bethlehem Steel Co., and Youngstown Sheet & Tube Co.

Augusta Housing Authority, Augusta, Ga., H. R. Powell, executive director, closes bids Sept. 5 for pipe line system for gas distribution in Olmsted housing development.

Ford, Bacon & Davis, Inc., 39 Broadway, New York, consulting engineer, in charge of a project sponsored by salt companies and chemical interests at Niagara Falls, N. Y., has plans for proposed pipe line from point near Linden, N. Y., to Niagara Falls, close to 60 miles, for brine transmission for chemical plants at latter point. A 375-acre lake of continuous salt brine, formed from salt deposits by means of hydraulic pumps, will be built at Linden, as source of supply. Special metal pipe to resist brine action will be used for line, which will operate under pressure. Work is scheduled to begin in fall. Cost close to $1,500,000.

United States Engineer Office, Charleston, S. C., asks bids until Sept. 12 for 100 lengths of electric lap-welded steel shore discharge pipe, each length 16 ft., with one elbow (Circular 11).

Quoting In Foreign Currencies Is Stopped

DUE to the crisis abroad, the American exporting group has ceased quoting in foreign currencies. Current quotations on a c.i.f. basis are at prevailing ocean freight tariffs, with provision for modification in the event of a change in tariff. A c.i.f. bid is good only for three days; an f.a.s. bid, five days. Little new inquiry has developed as a result of developments abroad.

80,000-Ton Coke Order For France Booked in U. S.

PHILADELPHIA COKE CO. recently booked an order for 80,000 tons of by-product coke from France for blast furnace use. Slightly over half the order has already been shipped, the balance to go as soon as bottoms can be obtained.

Munitions Swell Canadian Business

TORONTO, Ont.—While no large contracts were reported in the Canadian steel markets during the past week, a new undercurrent of interest has developed and officials of many companies express the opinion that prospects for the future have brightened considerably and it is possible that plants will maintain their present operating schedules for some months.

Prospects for war in Europe have resulted in a number of companies putting plants in shape for armament and munitions production. It is reported that the Angus shops of the Canadian Pacific Railway are equipped to immediately swing over to munitions production. Dealers state that there is some delay in obtaining delivery of new machine tools, while rebuilt lathes and tools are becoming scarce. A number of plants recently have closed contracts with Britain and France for munitions, armament and airplanes. Domestic demand for steel also is improving and the automotive industry is beginning to show more interest in the markets. Building trades also are picking up and orders pending for structural steel in the local area total upward of 5000 tons.

First Half Pig Iron Output 12,656,942 Tons

PRODUCTION of pig iron and ferroalloys in the United States for the first half of 1939 totaled 12,656,942 tons, compared with 8,104,021 tons in the corresponding period of 1938 and 11,056,840 tons in the last half of 1938. Ferroalloy production alone was 343,576 tons.

Of the pig iron produced 1,493,348 tons went for sale and 10,820,018 for the maker's own use. The industry during the first half of 1939 produced for sale 218,835 tons of basic pig iron, 110,800 tons of bessemer and low-phosphorus, 724,715 tons of foundry, 423,740 tons of malleable, 1006 tons of forge or mill and 14,252 tons of white and mottled, direct castings, etc., according to the American Iron and Steel Institute.

Demonstrates New Oil-Less Circuit Breakers

TWO new oil-less type circuit breakers designed for applications heretofore limited to oil-type breakers were demonstrated Aug. 17 by the General Electric Co. in the high voltage testing laboratory of its Schenectady works. Some 250 public utility, railroad and industrial engineering executives attended the tests.

One of the new circuit breakers, called the "Magne-blast" because it interrupts its arc magnetically, introduces a new principle in the technique of fast circuit interruption in air. It is designed for vertical-lift metal-clad switchgear and is for 5000-volt service at interrupting ratings up to 150,000 kva.

The second unit, the air-blast circuit breaker, utilizes a blast of compressed air to interrupt the circuit and break the arc. It is designed for 15,000-volt service at interrupting ratings up to 1,500,000 kva. In addition to operating the breaker, the stream of air removes the arc products, causing the circuit to be interrupted at first current zero after the contacts have parted.

The interrupting ratings of both breakers were exceeded by as much as 50 per cent. The air blast breaker was tested first with seven interruptions; in the final test it closed 80,000 amp. peak inrush current and interrupted 730,000 kva. after six cycles. Duration of arc was only one-half cycle. Tests of the Magne-blast breaker were equally severe. Both breakers have been designed to permit standard arrangement of buses, current transformers, mechanical interlocks and associated devices. Each breaker is assembled and shipped as a single unit. In size, they are smaller than oil breakers of comparable rating.

The demonstrations were followed by a dinner in the evening, at which M. O. Troy, commercial vice-president, General Electric Co., was toastmaster, and E. O. Shreve, G-E vice-president in charge of apparatus sales, and D. C. Prince, engineer of the switchgear division, were speakers.

FABRICATED STEEL

NORTH ATLANTIC STATES
AWARDS

1600 Tons, Long Island, N. Y., grade crossing crossing elimination, Long Island Railroad, to Bethlehem Steel Co., Bethlehem, Pa.

1400 Tons, Providence, R. I., viaduct and approaches, to American Bridge Co., Pittsburgh.

625 Tons, New York, apartment building, 254th Street and Riverdale Avenue, to Wyatt Iron Works, New York.

615 Tons, Washington, Thomas Jefferson Memorial High School, to Bethlehem Steel Co., Bethlehem, Pa.

490 Tons, Pittsburgh, Terrace Village building, to Guibert Steel Co., Pittsburgh.

375 Tons, New York, theater for Metropolitan Housing project in Bronx, to Ingalls Iron Works Co., Birmingham.

320 Tons, Columbia County, N. Y., State highway bridge, to American Bridge Co., Pittsburgh.

225 Tons, Oswego, N. Y., Central New York Power Corp., 51 transmission towers, to Lehigh Structural Steel Co., Allentown, Pa.

220 Tons, Everett, Pa., highway bridge, section 14-A, route 39, P.T.C., to American Bridge Co., Pittsburgh.

175 Tons, Cambridge, Mass., swimming pool building, to Lehigh Structural Steel Co., Allentown, Pa.

160 Tons, Downington, Pa., two highway bridges, to Bethlehem Steel Co., Bethlehem, Pa.

110 Tons, New Kensington, Pa., research laboratory, Aluminum Co. of America, to Ingalls Iron Works Co., Birmingham.

THE SOUTH

1455 Tons, Pasadena, Tex., Champion Paper & Fiber Co. mill, to Mosher Steel Co., Dallas, Tex.

375 Tons, Hale County, Tex., bridge, to Capitol Steel & Iron Co., Oklahoma City.

235 Tons, Parker County, Tex., bridge, to Peden Iron & Steel Co., Houston, Tex.

140 Tons, Bastrop County, Tex., bridge, to North Texas Iron & Steel Co., Fort Worth, Tex.

115 Tons, Brazoria, Tex., approach to Brazoria bridge, to Mosher Steel Co., Dallas, Tex.

CENTRAL STATES

700 Tons, Toronto, Ohio, extension to Commonwealth & Southern Corp. station, to Ingalls Iron Works Co., Birmingham.

638 Tons, Milwaukee, apartment building, to Milwaukee Bridge Co., Milwaukee.

600 Tons, Dayton, Ohio, addition for Dayton Power & Light Co. at Millers Ford, to Burger Iron Works, Akron, Ohio.

401 Tons, Evanston, Ill., Scott Hall, Northwestern University, to Hansell-Elcock Co., Chicago.

270 Tons, Chicago, widening, 16th Street crossing, to American Bridge Co., Pittsburgh.

177 Tons, Lake Mills, Wis., State project 1672 to Lakeside Bridge & Steel Co., Milwaukee.

175 Tons, Cleveland, Aluminum Co. of America press building No. 101, to Bethlehem Steel Co., Bethlehem, Pa.

125 Tons, Evanston, Ill., store building, R. E. Corp., to Bethlehem Steel Co., Bethlehem.

100 Tons, Mansfield, Ohio, Tappan Stove Co. factory, to Mansfield Structural & Erecting Co.

WESTERN STATES

300 Tons, San Francisco, Washington High School, to Judson-Pacific Co., San Francisco, through De Luca & Sons, San Francisco, contractors.

200 Tons, McChord Field, Wash., hangar additions, to Poole & McGonigle Co., Portland, Ore., through Sound Construction & Engineering Co., Seattle, contractor.

180 Tons, San Francisco, apartment house, to Golden Gate Iron Works, San Francisco.

180 Tons, Ventura County, Cal., Casitas Pass Road bridge, to Pacific Iron & Steel Co., Los Angeles.

115 Tons, Sun Valley, Idaho, aerial ski ropeway for Union Pacific Railroad, to Poole & McGonigle Co., Portland, Ore.

Mare Island Navy Yard, Cal., 14 traveling bridge cranes (Specification 9236), to Harnishfeger Corp., San Francisco.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

5000 Tons, Boston, building, New England Mutual Life Insurance Co. building.

3600 Tons, Burlington, N. J., extension to power house, Public Service Electric & Gas Co.

1700 Tons, Edgewater, N. J., Hills Bros. Coffee Co. buildings.

245 Tons, New York, steel curbing, contract No. 12.

235 Tons, Westmoreland County, Pa., three spans for Pennsylvania Turnpike Commission.

230 Tons, Pittsburgh, Mission Street bridge.

230 Tons, N. Woodstock, N. H., arch bridge for State.

225 Tons, Brooklyn, plant alterations, National Lead Co.

200 Tons, Brattleboro, Chester and Brandon, Vt., State beam spans.

200 Tons, Hyde Park, N. Y., Franklin D. Roosevelt library.

200 Tons, Woodstock, N. H., State bridge.

145 Tons, Kings Park, N. Y., State railroad trestle.

130 Tons, Indiana County, Pa., Loyalhanna dam, U. S. Engineers office.

120 Tons, Ithaca, N. Y., laboratory building and greenhouse, for Department of Agriculture.

100 Tons, Whitneyville-Machias, Me., State bridge.

CENTRAL STATES

800 Tons, Youngstown, Marshall Street bridge; bids Sept. 7.

750 Tons, Peru, Ind., State bridge, contract No. 1842.

450 Tons, Alton, Ill., building, Alton Boxboard Co.

400 Tons, Noblesville, Ind., factory building extension, Firestore Tire & Rubber Co.

300 Tons, Oakland City, Ind., State bridge, contract No. 1844.

250 Tons, Chicago, Montgomery Ward retail store.

165 Tons, Indianapolis, Thomas Carr Howe High School addition.

145 Tons, Detroit, garage building, Michigan Bell Telephone Co.

135 Tons, Valpariso, Ind., State bridge, contract No. 1841.

100 Tons, Toledo, hockey rink.

WESTERN STATES

300 Tons, Alameda, Cal., Navy power house and warehouse.

235 Tons, Luzena, Ariz., State beam span.

FABRICATED PLATES

AWARDS

330 Tons, Stuart, Fla., lock No. 1, St. Lucie Canal, to Virginia Bridge Co., Roanoke, Va.

210 Tons, Rutledge, Tenn., volute casings for Bureau of Reclamation, to Baldwin-Southwark Corp., Philadelphia.

200 Tons, Alcoa, Tenn., tanks for Aluminum Co. of America, to Chicago Bridge & Iron Co., Chicago.

110 Tons, Chester, Pa., gas holder for United Engineers & Constructors, to Cruse-Kemper Co., Ambler, Pa.

PENDING PROJECTS

12,000 Tons, Toledo, 7000 ft. of 60-in. pipe, for municipal intake feeders, bids Sept. 27.

SHEET PILING

AWARDS

800 Tons, Cleveland, municipal light plant, to Carnegie-Illinois Steel Corp., Pittsburgh, through Lombardo Brother Construction Co., Cleveland.

400 Tons, Cleveland, State highway project No. 93 at Willow Station, to Bethlehem Steel Co., Bethlehem, Pa., through Herkner Construction Co., Cleveland.

REINFORCING STEEL

. . . Awards of 8900 tons; 8300 tons in new projects.

ATLANTIC STATES
AWARDS

1240 Tons, Cleveland, municipal light plant, to Carnegie-Illinois Steel Corp., Pittsburgh, through Lombardo Brothers Construction Co., Cleveland.

290 Tons, Bedford County, Pa., section 13D, P.T.C., to Jones & Laughlin Steel Corp., Pittsburgh, through Nelo L. Teer, Durham, N. C., contractor.

275 Tons, Fulton County, Pa., Sideling Hill ventilation project, to Truscon Steel Co., Youngstown, through Ritter Bros., Harrisburg, contractor.

200 Tons, New York, office, Aetna Life Insurance Co., to Bethlehem Steel Co., Bethlehem, Pa., through Cummins Construction Co., contractor.

200 Tons, Queens, N. Y., Cross Island Parkway, MC3916, to Bethlehem Steel Co., Bethlehem, Pa., through Candeloro Construction Co., contractor.

200 Tons, North Bergen, N. J., housing project, to Bethlehem Steel Co., through Edw. Reihl, contractor.

175 Tons, Brooklyn, Circumferential Parkway, Flatbush to Nostrand Avenue, to Jones & Laughlin Steel Corp., Pittsburgh, through Elmhurst Contracting Co., Elmhurst, N. Y.

138 Tons, Somerset County, Pa., Laurel Hill ventilation project, to Truscon Steel Co. through Ritter Bros., Harrisburg, contractor.

125 Tons, West Warwick, R. I., sewage disposal plant, to Northern Steel Co., Boston. James A. Monroe & Sons Co., North Attleboro, Mass. contractor.

120 Tons, Wilmington, Del., Continental American Insurance Co., to Bethlehem Steel Co. Bethlehem, Pa., through Turner Construction Co., contractors.

100 Tons, Kings Park, N. Y., infirmary building No. 15, to Bethlehem Steel Co., Bethlehem, Pa., through Silverblatt & Lasker, contractors.

CENTRAL AND WESTERN STATES

2900 Tons, Chicago, Ida B. Wells housing project, to Truscon Steel Co., Youngstown.

1800 Tons, Niland, Cal., All-American Canal (Invitation D-42291-A) to Columbia Steel Co., San Francisco.

483 Tons, San Francisco, Lincoln High School, to Bethlehem Steel Co., San Francisco; through Meyer Construction Co., contractor.

250 Tons, McChord Field, Wash., hangar additions, to Truscon Steel Co., Seattle; through Sound Construction & Engineering Co., Seattle, contractor.

150 Tons, Red Bluff, Cal., bridges, to Truscon Steel Co., San Francisco; through Piazza & Huntley and J. P. Brennan, Redding, contractors.

150 Tons, Holland, Mich., electric generating plant to Calumet Steel Co., Chicago.

100 Tons, Chicago, uptown post office, to Calumet Steel Co., Chicago.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

2500 Tons, Queens, N. Y., South Ozone Park sewer project; George F. Driscoll Co. Brooklyn, low bidder.

561 Tons, Norfolk, Va., Navy Yard requisition 81 (1940) PWA, Hall-Hodges, Inc., Philadelphia, low bidder.

CENTRAL AND WESTERN STATES

3010 Tons, Parker, Ariz., Indian Service (Invitation 538); Pacific States Steel Co., Niles, Cal., low bidder at $1.67 per 100 lb., f.o.b. plant.

1337 Tons, Pollock, Cal., Central Valley project; bids to be readvertised by Bureau of Reclamation Sept. 7

1063 Tons, Hammond, Ind., sewage treatment plant; bids Aug. 31.

1000 Tons, Grand Rapids, Mich., reservoir; bids in.

715 Tons, Los Angeles, Lankersheim Boulevard bridge; Carlo Bongiovanni, Hollywood, Cal., low bidder on general contract.

700 Tons, Rochester, Minn., St. Mary's Hospital.

650 Tons, Alameda, Cal., Navy Yard power house and warehouse.

300 Tons, Grand Rapids, Mich., pumping stations.

200 Tons, Chicago, Eastman Kodak Co. building.

152 Tons, Lapine, Ore., Wickiup Dam (Invitation 30707-A); bids Sept. 5.

152 Tons, Lapine, Ore., Wickiup Dam (Invitation 30708-A); bids in.

152 Tons, Cody, Wyo., Shoshone project (Invitation 48216-A); bids in.

150 Tons, Detroit, General Electric Co. building.

. . . NON-FERROUS . . .

. . . Domestic buyers assume watchful attitude as European crisis develops . . . Great Britain prohibits export of essential materials . . . War threats spur tin demands.

NEW YORK—The developments in Europe over the past week kept the non-ferrous markets in such a confused state that for the most part domestic buyers assumed an attitude of watchful waiting, buying very little metal despite threats of higher prices should war eventuate. The first move in this hectic week was declaration early in the week that Great Britain would curb exports of copper, rubber and other essential materials as a conservation measure. This naturally turned many Continental buyers to this country, and purchases by Germany, Poland, Japan and England were reported, although tonnages involved could not be determined. Speculative buying was very much in evidence in London all week, but as yet there are no indications of its presence in the domestic picture. The second move was withdrawal of British support of sterling which made trading in tin and export copper extremely difficult. The export copper price fluctuated widely during the week, with 9.98c. and 10.70c. being the two extremes. This morning's business was reported done at around 10.70c. per lb., c.i.f., usual base ports. Domestic sales for the week were about 2150 tons as against 3500 in the previous period. Producers' prices here were unchanged all week at 10.50c. per lb., Connecticut Valley.

Zinc

Prime Western sales in the past week were 3691 tons against 1650 in the preceding period. Of this total, 1800 was for August shipment, 1300 from September to November and 550 beyond. About 2160 tons were sold at 4.75c. per lb., East St. Louis, while the balance was average price business. Shipments of prime were 4736 tons against 4519 tons a week ago, with backlogs consequently lowered to 46,416 tons. Prices were unaltered all week at 5.14c. per lb., New York.

Lead

Confusion over the foreign situation acted to slow down demands last week but some sellers were still able to dispose of the equivalent of the week's intake. Opening of October books attracted little attention, the bulk of the demand being for nearby metal. The London price this morning was 3.20c. per lb., as compared with 3.37c. a week ago, while the domestic price remains unchanged at 5.05c. per lb., New York.

Tin

Fear that war would shut off sources of tin caused domestic buyers to swamp the market last week with orders in a buying movement of such tremendous proportions as to practically exhaust all available supplies. It is estimated that between 3000 and 4000 tons of tin was bought during the week, all of it calling for nearby delivery. The demand was strictly consumer demand. Prices advanced to 49.50c., New York, last Thursday, but dropped to 48.875 when Great Britain withdrew support of sterling on Friday. By today it had recovered to 49.125c. Cash standards in London remain unchanged at £229 17s. 6d.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Aug. 23	Aug. 24	Aug. 25	Aug. 26	Aug. 28	Aug. 29
Copper, Electrolytic[1]	10.50	10.50	10.50	10.50	10.50	10.50
Copper, Lake	10.50	10.50	10.50	10.50	10.50	10.50
Tin, Straits, New York	49.00	49.50	48.875	....	48.125	49.125
Zinc, East St. Louis[2]	4.75	4.75	4.75	4.75	4.75	4.75
Lead, St. Louis[3]	4.90	4.90	4.90	4.90	4.90	4.90

[1] Delivered Conn. Valley. Deduct ¼c. for New York delivery. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Prices

Cents per lb., Delivered

	New York	Cleveland
Tin, Straits pig	50.00c.	51.50c.
Copper, Lake	11.625c.	11.50c.
Copper, electro	11.50c.	11.50c.
Copper, Castings	11.00c.	11.25c.
*Copper sheets, hot-rolled	18.62c.	18.62c.
*High brass sheets	16.85c.	16.85c.
*Seamless brass tubes	19.60c.	19.60c.
*Seamless copper tubes	19.12c.	19.12c.
*Brass rods	12.19c.	12.19c.
Zinc slabs	6.15c.	6.90c.
Zinc sheets, No. 9 casks	10.75c.	12.10c.
Lead, American pig	6.05c.	5.95c.
Lead, bar	8.50c.	8.25c.
Lead, sheets, cut	8.00c.	8.00c.
Antimony, Asiatic	15.00c.	17.00c.
Alum., virgin, 99 per cent plus	21.50c.	22.50c.
Alum., No. 1 remelt., 98 to 99 per cent	19.00c.	19.50c.
Solder, ½ and ½	29.20c.	29.50c.
Babbitt metal, commercial grade	21.20c.	21.50c.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/3; on brass sheets and rods, 40, and on brass and copper tubes, 25.

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	8.375c.	9.00c.
Copper, hvy. and wire	7.375c.	7.75c.
Copper, light and bottoms	6.50c.	6.975c.
Brass, heavy	4.50c.	5.00c.
Brass, light	3.625c.	4.375c.
Hvy. machine composition	6.50c.	7.375c.
No. 1 yel. brass turnings	4.25c.	4.75c.
No. 1 red brass or compos. turnings	6.375c.	6.875c.
Lead, heavy	4.125c.	4.50c.
Cast aluminum	6.50c.	7.75c.
Sheet aluminum	12.50c.	14.00c.
Zinc	2.25c.	3.50c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt, New York: Asiatic, 14c. a lb., f.o.b.; American, 12c. a lb. QUICKSILVER, $82.50 to $84.50 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 10.75c. a lb.

Navy Awards Cable Contracts

WASHINGTON—The Navy Department's Bureau of Supplies and Accounts has awarded three contracts for cable to these companies: John A. Roebling's Sons Co., Trenton, N. J., $5099; National Electric Products Corp., Pittsburgh, $14,272, and Rockbestos Products Corp., New Haven, Conn., $6541. Gardner-Denver Co., Washington, received a $19,511 contract for tools and wrenches, air compressors and spare parts.

PLANT EXPANSION AND EQUIPMENT BUYING

NORTH ATLANTIC

Grumman Aircraft Corp., Bethpage, L. I., airplanes and parts, has let general contract to Austin Co., New York, and Cleveland, for one-story addition, totaling 48,000 sq. ft. of floor space, primarily for expansion in assembling division. Cost close to $150,000 with equipment.

Wishnick-Tumpeer, Inc., 295 Madison Avenue, New York, manufacturer of industrial chemicals, oils, etc., has acquired property, 600 x 785 ft., at Fifty-first Street and Merrimac Avenue, Stickney, near Chicago, for new branch refinery for asphalt and oil production. Cost about $150,000 with equipment.

Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, Brooklyn, asks bids until Sept. 6 for chromium plated reflectors, lens assemblies, flashlights, lampholders, etc. (Circular 44); until Sept. 18, 32,000 ft. of 50-pair cable and 31 reels (Circular 56).

International Nickel Co., 67 Wall Street, New York, has approved plans for group of one-story buildings near Garson, Copper Cliff district, Ont., including machine shop, 40 x 60 ft.; plate shop, 35 x 50 ft.; steel-working shop, 35 x 60 ft.; woodworking shop, 40 x 60 ft.; boiler shop, 35 x 50 ft.; and electrical shop, 30 x 60 ft. Cost over $100,000 with equipment.

Anderson Chemical Sales Corp., 25-12 Forty-first Avenue, Long Island City, industrial chemicals, has leased space in building at 22-14 Fortieth Avenue for plant, removing present works from present location and increasing capacity.

Commanding Officer, Ordnance Department, Watervliet Arsenal, Watervliet, N. Y., asks bids until Sept. 5 for bronze castings (Circular 64); until Sept. 13 for seven horizontal boring, drilling and milling machines (Circular 62).

Sylvania Industrial Corp., 122 East Forty-second Street, New York, cellulose transparent paper, has let general contract to Hughes-Foulkrod Co., Schaff Building, Philadelphia, for one-story addition to mill at Fredericksburg, Va., for storage and distribution. Cost about $60,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Sept. 5 for copper-nickel alloy condenser tubes (Schedule 6997) for Brooklyn Navy Yard; electrically-operated valves (Schedule 7004) for Brooklyn and Philadelphia yards; until Sept. 8, hand and electric inertia aircraft starters (Schedule 7020) for Philadelphia and Sewall's Point yards.

Luria Steel & Trading Corp., 233 Broadway, New York, has organized Builders' Steel Products Corp., a subsidiary, to specialize in distribution of steel products for building service. New company has leased space in building at 310 Twelfth Street, Jersey City, N. J., for storage and distributing plant.

State Purchase Commissioner, State House, Trenton, N. J., asks bids until Sept. 7 for one hydraulic testing machine.

Heyer Products Co., Inc., 740 Washington Avenue, Belleville, N. J., manufacturer of electric battery chargers, testers, parts, etc., has let general contract to Bonnanno Construction Co., North Bergen, N. J., for new one-story plant, about 44,000 sq. ft. of floor space, on 2½-acre tract at Cortlandt and Little Streets, recently acquired. Cost about $150,000 with equipment. Following completion, scheduled for November, it is proposed to build a one-story addition of 20,000 sq. ft. of floor space on adjoining site. Cost over $50,000 with equipment. K. B. C. Smith, 136 Englewood Avenue, Englewood, N. J., is architect.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until Sept. 7 for aluminum alloy rods and for reworking 19,300 lb. of aluminum turnings (Circular 149), reworking 15,400 lb. of large heavy brass fuse parts (Circular 150); until Sept. 6, three sedimentation tanks, one drown tank for acid tetryl, and one flotation tank for separation of tetryl and spent acid (Circular 145); until Sept. 5, six automatic chip conveyors for automatic screw machines (Circular 224), one motor-driven slurry pump, 2-in. suction (Circular 220), three precision surface grinders (Circular 222).

Borough Council, Womelsdorf, Pa., asks bids until Sept. 5 for steam boiler for power house, including coal stoker unit and accessories.

Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia, asks bids until Sept. 12 for one plain motor-driven hydraulic grinder (Circular 169); until Sept. 13 for reworking 73,250 lb. of brass scrap into brass strip (Circular 189); until Sept. 14, two, three or four generating units (Circular 149).

BUFFALO DISTRICT

American Brake Shoe & Foundry Co., 1673 Bailey Avenue, Buffalo, plans one-story addition. Cost about $50,000 with equipment. Main offices are at 230 Park Avenue, New York.

Kilian Mfg. Co., 107 North Franklin Street, Syracuse, N. Y., ball bearnings, casters, etc., has let general contract to W. J. Burns Construction Co., Heffernan Building, for one-story addition, 175 x 180 ft. Cost about $75,000 with equipment. Merton E. Granger, Empire Building, is architect.

WASHINGTON DIST.

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until Sept. 5 for one all-steel reaction kettle, lined with acid-resisting glass and equipped with steam jacket (Circular 62); until Sept. 6, tank gaskets, vent gaskets, vent springs, operating rod springs, retainer plates, closure gaskets, locking studs, vent release and operating cables (Circular 61).

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Sept. 27 for four 40-ton and eight 30-ton diesel engine locomotive cranes, standard gage, eight-wheel, for Boston, Brooklyn and Portsmouth, N. H., Navy yards (Specifications 9365); also bids, no closing date stated, for boilers, oil and gas burners, feed water heater and storage tank, fuel oil tanks, fuel oil pumping set, boiler appurtenances, boiler feed pumps, steam water heater, instruments and auxiliary equipment for power plant at Marine Barracks, Quantico, Va. (Specifications 9343).

General Purchasing Officer, Panama Canal, Washington, asks bids until Sept. 6 for brass machine and brass wood screws, brass plate washers, galvanized wire poultry-netting and wire fence staples, copper tacks, steel packing case strapping, etc. (Schedule 3564); until Sept. 7 steel windows and operating devices, metal roofing materials, wire mesh partitions, galvanized straps, galvanized clips, etc. (Schedule 3566); until Sept. 8 one motor-driven bending roll, with 7½-hp. motor (Schedule 3568).

Texas Co., Haven and Gough Streets, Baltimore, plans one-story oil products experimental and testing laboratory at 4000 Asiatic Avenue. Cost close to $40,000 with equipment. Main offices are at 135 East Forty-second Street, New York.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Sept. 5 for one double housing planer (Schedule 7028) for Washington; one grinder (Schedule 7024); until Sept. 8, external grinder (Schedule 7022); three metal-cutting machines (Schedule 7027), all motor-driven, for Alexandria, Va., yard.

NEW ENGLAND

Van Norman Machine Tool Co., 160 Wilbraham Avenue, Springfield, Mass., milling machines and other machine tools and parts, has started work on two-story addition, 20 x 81 ft. Cost close to $40,000 with equipment. Fred T. Ley & Co., Inc., 1215 Main Street, is contractor.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until Sept. 7 for automatic pistol parts, caliber 0.45, including barrel bushings, drawing hammers, drawing ejectors, front sights, rear sights, mainspring housings, safety locks, assembly slides, etc. (Circular 28), semi-automatic turning lathes (Circular 33).

Concord Silversmiths, Ltd., Concord, N. H., has been organized by local interests, headed by John D. Murphy, president and treasurer, and has acquired the plant and property of Concord Silversmiths Corp., bankrupt. New owner will resume operations at once, specializing in production of heavy silver flatware. Cecil W. Whitney is secretary.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Sept. 8 for air ejectors, with spare parts, tools and wrenches (Schedule 6993); until Sept. 12, deaerating type feed water heaters, spare parts, tools and wrenches (Schedule 6996) for Boston, Charleston and Puget Sound navy yards.

Greenfield Tap & Die Corp., Greenfield, Mass., has rejected bids for construction of a plant addition.

SOUTH ATLANTIC

Bahan Textile Machinery Co., 104 Hudson Street, Greenville, S. C., textile machinery and parts, has approved plans for one-story addition, 75 x 100 ft. Cost close to $40,000 with equipment.

Polk Co., Haines City, Fla., citrus fruit canner, has let general contract to Paul Smith Construction Co., Haines City, for one-story branch canning plant on five-acre tract near Columbus Drive, Tampa, Fla., recently acquired, including power house and auxiliary structures. Cost over $50,000 with equipment.

City Council, Homestead, Fla., plans expansion and improvements in municipal power plant, including new diesel-engine generator unit and accessory equipment. Cost about $60,000. William Sydow, 3461 Main Highway, Cocoanut Grove, Fla., is consulting engineer.

WESTERN PA. DIST.

Pittsburgh Coal Co., Oliver Building, Pittsburgh, has approved plans for expansion and improvements in river-rail terminal at Smith's Ferry, Pa., and at coal-washing plant at Negley, Ohio, including additional machinery. New steel storage bins, hoppers, conveying machinery and other mechanical-handling equipment will be installed at Negley plant, and similar mechanical-handling equipment, loaders, etc., at terminal plant noted. Cost about $500,000.

Jamestown Paint & Varnish Co., Jamestown, Pa., plans rebuilding part of plant recently destroyed by fire. Loss close to $100,000 with equipment.

SOUTH CENTRAL

Board of City Commissioners, Gulfport, Miss., has authorized plans for one-story addition to municipal warehouse on waterfront, consisting of five sections, each about 160 x 225 ft., with three loading tracks. Cost close to $300,000 with elevating, conveying and other mechanical-handling equipment. Shourds & Bean, Gulfport, are architects and engineers.

United States Engineer Office, Louisville, asks bids until Sept. 8 for 34 valve blades, with shafts, keepers, bolts, nuts, taper pins, washers, bushings, etc. (Circular 70).

Southern Cement Co., Chamber of Commerce Building, Birmingham, plans rebuilding part of mill at North Birmingham, recently

destroyed by fire. Loss close to $100,000 with equipment.

Auto Vehicle Parts Co., 1024 Saratoga Street, Newport, Ky., has let general contract to Lehigh Construction Co., 418 York Street, for one-story addition. Cost close to $40,000 with equipment. John L. McDermott, 65 Bluegrass Street, Fort Thomas, Ky., is architect.

SOUTHWEST

Wackman Welded Ware Co., 2412 South Seventh Street, St. Louis, steel barrels, drums, etc., will begin work early in September on branch plant in Goosport district, Lake Charles, La., where tract has been secured. It will comprise three one-story, units for main manufacturing, raw material storage and distribution, and finished storage respectively, all connected by overhead conveyor system and floor level runways. Power house also will be built. It is proposed to use prefabricated steel buildings, with main structure, 100 x 600 ft. Cost close to $150,000 with equipment.

Purchasing and Contracting Officer, District Quartermaster, Missouri District, CCC, Jefferson Barracks, Mo., asks bids until Sept. 5 for 65,000 ft. of electrical wire (Circular 5703-16).

Anheuser-Busch, Inc., 721 Pestalozzi Street, St. Louis, has let contract to Borsari Tank Corp. of America, Inc., 60 East Forty-second Street, New York, for design and erection of five-story addition to main brewery for fermenting department, storage and distribution. Cost about $750,000 with equipment.

Construction Service, Veterans' Administration, Washington, asks bids until Sept. 12 for steel water tank and tower for institution at Wadsworth, Kan.

Barnsdall Refining Corp., Tulsa, Okla., has approved plans for expansion and improvements in oil refinery at Corpus Christi, Tex., to increase capacity from 8000 to 20,000 bbl. per day. Steel tank storage department will be enlarged. Cost over $100,000 with equipment.

Commanding Officer, Ordnance Department, San Antonio Arsenal, San Antonio, Tex., asks bids until Sept. 12 for saw blades, hacksaw blades, reamers, shears, thickness gages, chisels, cutters, drills, files, nippers, screw drivers, bolts, nuts, rivets, acetylene utility heater, wrenches, bits and other equipment (Circular 1).

Board of Directors, Lower Colorado River Authority, Littlefield Building, Austin, Tex., asks bids until Sept. 6 for galvanized steel towers and switching structures for new 69-kv. transmission line.

OHIO AND INDIANA

East Dayton Tool & Die Co., 310 East Second Street, Dayton, Ohio, has let general contract to B. G. Danis Co., First and Webb Streets, for one and two-story and basement plant addition, McCook Field district, 82 x 125 ft., with boiler house adjoining. Cost about $65,000 with equipment. Walter J. Theis, Mutual Home Building, is architect.

Kroger Grocery & Baking Co., 35 East Seventh Street, Cincinnati, plans one-story addition to branch meat-packing plant at Columbus, Ohio. Cost about $50,000 with equipment.

Diamond Portland Cement Co., Middle Branch, Ohio, has asked bids on general contract for one-story building at North Canton, Ohio, for storage and distribution. Cost about $150,000 with equipment.

Madison Food Products Co., Inc., 5201 Denison Avenue, Cleveland, plans new power house at plant at Medina, Ohio. Cost about $45,000 with boiler unit and accessories, pumping machinery and auxiliary equipment. Ernest McGeorge, 9400 Quincy Avenue, Cleveland, is consulting engineer.

Contracting Officer, Materiel Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until Sept. 5 for 100 to 999 engine tachometer outlet adapter assemblies (Circular 131); until Sept. 6, drive pin punches and center punches (Circular 159), seven acetylene gas generators (Circular 143), anti-corrosion cartridge assemblies (Circular 165); until Sept. 7 for quantity of connectors, elbows, nipples, nuts, tees, and unions, all solderless, valves, etc. (Circular 147), machine benches, soldering and brazing benches, steel work benches, steel top work benches, adjustable metal stools, metal swivel stools, etc. (Circular 156); until Sept. 11, two precision-type tool-room lathes (Circular 164).

Public Service Co. of Indiana, Traction Terminal Building, Indianapolis, plans new steam-electric generating station at Dresser, Ind., with initial capacity of 50,000-kw.; also two new 132,000-volt transmission lines from that point to connection with present system, including switching stations and other field structures. Entire project will cost about $6,400,000 and will be carried out by Dresser Power Corp., Dresser, an affiliated organization.

MICHIGAN DISTRICT

General Electric Co., Third and Antoinette Avenues, Detroit, has asked bids on general contract for one-story addition to local factory branch, storage and distributing plant. Cost over $60,000 with equipment. Albert Kahn, Inc., New Center Building, is architect and engineer.

Shaw-Walker Co., Muskegon, Mich., metal filing cabinets and equipment, plans rebuilding part of plant recently destroyed by fire. Loss close to $100,000 with equipment.

Gordon Baking Co., 2303 East Vernor Avenue, Detroit, has acquired tract at Sturgis, Mich., for new one-story plant for construction of truck bodies for company motor cars, including parts and assembling departments. A repair and overhaul division will be installed. Present plants at Detroit and Chicago will be removed to new location where operations for work noted will be concentrated. Cost close to $85,000 with equipment.

MIDDLE WEST

Johnson Motors, Inc., Lake Front, Waukegon, Ill., outboard gasoline engines and parts, has asked bids on general contract for one-story addition, about 50,000 sq. ft. of floor space. Cost close to $100,000 with equipment.

Hanson Scale Co., 525-31 North Ada Street, Chicago, automatic weighing scales, parts, etc., plans two-story addition, 50 x 135 ft. Cost over $50,000 with equipment.

Commanding Officer, Ordnance Department, Rock Island Arsenal, Rock Island, Ill., asks bids until Sept. 18 for 17 1-ton tractor cranes (Circular 120).

Rath Packing Co., 1600 Sycamore Street, Waterloo, Iowa, meat packer, will take bids soon on general contract for one-story branch plant at Decatur, Ill., 90 x 183 ft. Cost about $85,000 with equipment.

American Printing Ink Co., Division of General Printing Ink Corp., 2324 West Kinzie Street, Chicago, has leased, for new plant, three buildings to be erected by Clearing Industrial District, Inc., 28 South Dearborn Street, at Sixty-seventh Street and Melvina Avenue, consisting of main two-story and basement unit, 50 x 138 ft., and two one-story structures, each 25 x 50 ft. Cost over $90,000 with equipment. Construction will begin at once. John S. Cromelin, 6455 South Central Avenue, is architect.

Waukesha Foundry Co., Lincoln Avenue, Waukesha, Wis., brass, aluminum and kindred castings, has asked bids on general contract for one-story addition, 80 x 130 ft. Cost over $60,000 with equipment. Mark F. Pfaller, 8525 Ravenswood Circle, is architect.

Fellens Coal & Dock Co., near North Humboldt Avenue, Milwaukee, plans rebuilding part of coal storage and distributing plant, and dock structure recently destroyed by fire. Loss about $60,000 with loading and other mechanical equipment.

PACIFIC COAST

Northrop Aircraft, Inc., 126th and Acacia Streets, Hawthorne, Cal., airplanes and parts, plans new one-story plant on 72-acre tract recently acquired near 120th Street and Crenshaw Boulevard. Initial structure will total about 100,000 sq. ft. of floor space, for parts production and assembling. Cost over $175,000 with equipment. B. G. Reed is company engineer in charge.

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Sept. 27 for one 25-ton diesel-electric revolving jib crane mounted on steel pontoon at Mare Island Navy Yard (Specifications 9363); also bids, no closing date stated, for one-story engine test building at naval air station, Alameda, Cal. (Specifications 9200).

Monrovia-Arcadia-Duarte Union High School District, Monrovia, Cal., plans one-story manual training shop at local high school, totaling about 8200 sq. ft. floor space. Cost close to $40,000 with equipment. R. M. Finlayson, Central Building, is architect.

True's Oil Co., 717 North Hamilton Street, Spokane, Wash., plans addition to bulk oil storage and distributing plant, including two-story warehouse, 44 x 52 ft., with service and garage building, 52 x 65 ft., adjoining, for company motor trucks, tanks and other structures. Cost close to $55,000 with equipment. Edward Peterson, Sherwood Building, is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Sept. 12 for cast bronze pipe and fittings (Schedule 7034) for San Diego Naval Air Station; two arc welding machines (Schedule 7015), 45 welding outlet panels (Schedule 7016) for Mare Island Navy Yard; one motor-driven hacksaw (Schedule 7009), motor-driven tool-room precision lathe, with equipment (Schedule 7008) for Seattle; four electric floor-type grinders, with motors and controllers and spare parts (Schedule 7033), 80 electric arc welding sets (Schedule 7017); until Sept. 15, four motor-driven engine lathes and spare parts (Schedule 7032) for Puget Sound, Wash., Navy Yard.

Construction Quartermaster, San Francisco district, Fort Mason, Cal., asks bids until Sept. 6 for pole line equipment, including galvanized iron braces, armored metallic cable, cable guy, guy anchors, lag screws, bolts, washers, galvanized iron clips, double-arming bolts, etc., and 8300 ft. of copper wire (Circular 6616-7).

Less Tin Used In First Half of 1939

WORLD tin consumption in the first six months of this year, at 74,900 tons, was 6000 tons or 7 per cent below the total for the first half of 1938, the International Tin Research and Development Council reports. Chief cause of the decline was drop of 60 per cent in consumption of U.S.S.R. and 19 per cent in Germany. The United Kingdom used 13 per cent more in the first half of this year and the United States, which accounts for 40 per cent of world consumption, used 18 per cent more. World production in first half was 62,800 tons, off 31 per cent from the like period a year ago.

World tin plate production in first six months was 1,900,000 tons, against 1,500,000 tons in 1938, a gain of 27 per cent. World automobile output in first six months was 2,814,000 units, up 39 per cent. U. S. share of first half automobile output was slightly over 70 per cent.

THIS WEEK'S MACHINE . . . TOOL ACTIVITIES . . .

. . . August volume has held up well in most districts . . . Inquiry volume continues high and outlook is good . . . Foreign orders not yet affected by European crisis.

Foreign Orders Not Yet Affected by Crisis

CINCINNATI—Although the European situation consumed a large portion of the attention of the district machine tool market so far as conversation was concerned, no definite or direct effect of the situation was noted in the demand last week. Total bookings were approximately on the same level as the preceding week and reflected about the same domestic and foreign interest as has heretofore been reported. The attitude generally in the market toward the European situation appears to be one of extreme interest, but not of concern. Orders generally from the foreign sources are being well maintained and even the abrogation of the Japanese Treaty which is to become effective the early part of next year has made no noticeable change in demand from this source. Inquiry continues to be in good volume with a fairly active interest being displayed on the part of domestic users for both retooling and re-equipping their shops.

Production in the Cincinnati area continues to be approximately 70 to 75 per cent of capacity, with a number of plants, however, running almost full. The delivery situation continues to be a matter of some concern since some plants are still falling behind in shipping dates.

Inquiry Strong in Cleveland Area

CLEVELAND—While new business in this immediate vicinity has assumed more of a waiting attitude recently, strong inquiry has developed for used machines. Representatives of eastern dealers are searching through local markets presumably on behalf of foreign nations or in anticipation of virile demand in the immediate future.

Local producers continue active against backlogs which contain a fair proportion of government business. Detroit sales have been brisk recently, including jig borers, drills, shapers and lathes. A Cleveland machine tool manufacturer placed some business this week. A large new planer was also sold. Inquiries in this city include a $55,000 milling planer. Most dealers are quoting machines here and there for customers' consideration, with large projects marking time.

August a Good Month For Chicago Sellers

CHICAGO—Present indications are that August will be a good month for Chicago machine tool sellers. Business is scattered from miscellaneous sources but unit volume is holding up well. The Rock Island Arsenal will probably buy a number of lathes and milling machines in September, the inquiries having been sent out some time ago. Rockford machine tool plants are quite busy, both domestic and foreign demand being responsible. Nearly all of the builders in Rockford plan to display new machines or new developments next month at Cleveland.

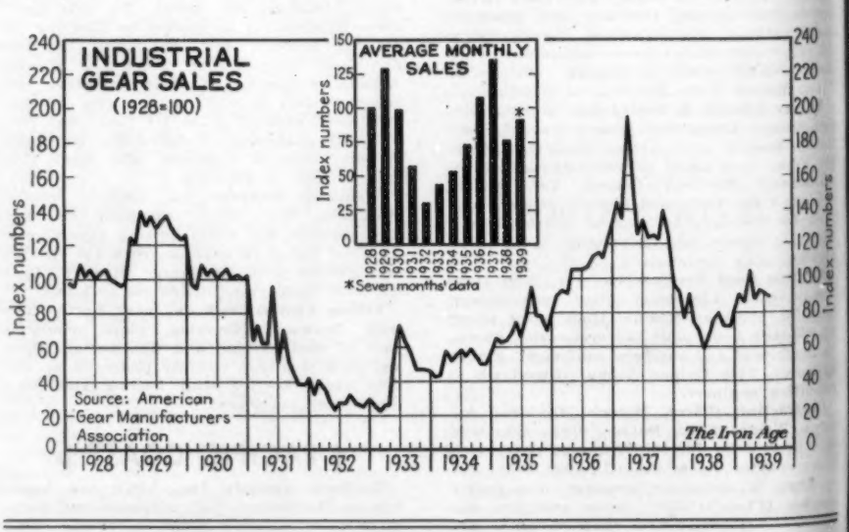
Ford Halts Buying for Rolls-Royce Engine Production

DETROIT—Ford activity looking toward the tooling up of an aircraft engine plant to supply Rolls-Royce engines to the French government reached a halting point last week. Numerous machine tool companies which were quoting on this equipment and some which had already received substantial orders were told that the entire program had been halted. No information could be obtained that would indicate whether this meant cancellation or not. The Ford tractor program is still active, although the peak has been passed. One machine tool source indicated that considerable delay had been encountered in delivering and installing equipment to some plants for 1940 automobile production. This, added to delays incident to the tool and die strike, is causing some delays in new car announcements and production schedules.

August Sales Fair but Volume Tapered at Month End

NEW YORK—With the exception of one leading dealer, most sellers in the metropolitan district have reported machine tool sales at a lower level in the past week or two. Because of the good volume in the earlier part of the month, however, August sales as a whole will compare very favorably with those of July. The dealer referred to reported a more than satisfactory volume of orders last week, with every indication that the current week would maintain the pace. As a result of this continued activity, August sales for this particular seller will be substantially above the July figure. What seemed particularly encouraging was the fact that at least 60 to 70 per cent of the August volume was from general industrial firms not dependent upon the government for business. The aircraft industry has been conspicuously absent during the summer months. The crisis abroad has had little or no effect upon domestic business thus far, and it is too early to judge the effect upon foreign orders, one way or the other. In the long run, it is assumed that the Russians will divert much of their machine tool import business to Germany.

IT takes gears to make the wheels of industry turn, and in the rate at which those gears are purchased may be found a reliable indication of the state of general industrial activity. In the accompanying graph, industrial gear sales for the past 12 years are plotted from data supplied by the American Gear Manufacturers Association. Space has been provided to enable the reader to keep the chart up-to-date by inserting the later months of the present year as the information becomes available. The smaller graph shows the average monthly sales. The chart covers the sale of industrial gearing made of cast iron, steel, rawhide, alloy materials, etc., but does not include automobile gears.



PRODUCTS INDEX

COAL, ORE & ASH HANDLING MACHINERY
Demag Corp., Duisburg, Germany
Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

COBALT METAL
Central Trading Corp., 511 Fifth Ave., N. Y. C.

COILS—Lead
National Lead Co., 111 Bdway., N. Y. C.

COILS—Pipe
Harrisburg (Pa.) Steel Corp.

COKE—Metallurgical
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.
Pickands Mather & Co., Cleveland.

COKE OVEN MACHINERY
Atlas Car & Mfg. Co., The, Cleveland.
Koppers Co., Engineering & Construction Div., Pittsburgh.

COLD ROLL FORMING MACHINES
McKay Machine Co., The, Youngstown, Ohio.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

COMBUSTION CONTROLS
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Morgan Construction Co., Worcester, Mass.

COMPOUNDS—Drawing
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.
Penola, Inc., Pittsburgh.
Standard Oil Co. (Indiana), Chicago.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

COMPRESSORS—Air
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Demag Corp., Duisburg, Germany
Westinghouse Air Brake Co., Industrial Div., Pittsburgh.
Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—Gas
Demag Corp., Duisburg, Germany
Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—Rebuilt. (See Clearing House Section)

CONDENSERS—Surface & Jet
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS—Flexible Metallic
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

CONTACTS—Electrical
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

CONTRACTORS' SUPPLIES — Second-Hand. (See Clearing House Section)

CONTROL SYSTEMS—Temperature
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLLERS—Crane
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—Electric
Clark Controller Co., The, Cleveland.
Cutler-Hammer, Inc., Milwaukee.
Electric Controller & Mfg. Co., The, Cleveland.
General Electric Co., Schenectady, N. Y.

CONTROLLERS—Valve, Electrically Operated
Cutler-Hammer, Inc., Milwaukee.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.

CONTROLS—Time Cycle
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CONVEYING AND ELEVATING MACHINERY
Farquhar, A. B., Co., Ltd., York, Pa.
Heyl & Patterson, Inc., Pittsburgh.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

CONVEYORS—Portable
Farquhar, A. B., Co., Ltd., York, Pa.

COPING MACHINES
Cleveland (Ohio) Punch & Shear Works Co., The.
Schatz Mfg. Co., The, Poughkeepsie, N. Y.

CORE OIL
Penola, Inc., Pittsburgh.
Sun Oil Co., Philadelphia.
Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS — See Grinding Wheels

COTTERS AND KEYS—Spring
Hindley Mfg. Co., Valley Falls, R. I.
Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.
Western Wire Prods. Co., St. Louis, Mo.

COUNTERBORES
Cleveland (Ohio) Twist Drill Co., The.
Clairing Tool Co., Detroit
Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—Production
Durant Mfg. Co., Milwaukee.
Veeder-Root, Inc., Hartford, Ct.

COUNTERS—Revolution, Recording
Durant Mfg. Co., Milwaukee.

COUNTING MACHINES
Durant Mfg. Co., Milwaukee.
Veeder-Root, Inc., Hartford, Conn.

COUPLINGS—Cut-off Friction
Foote Bros. Gear & Machine Co., 5301 H So. Western Blvd., Chicago, Ill.

COUPLINGS—Flexible
Crocker-Wheeler Electric Mfg. Co., Ampere, N. J.
Koppers Co., Bartlett Hayward Div., Baltimore, Md.
Poole Foundry & Mch. Co., Baltimore, Md.
Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS—Pipe
Harrisburg (Pa.) Steel Corp.
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—Crawling Tractor
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Demag Corp., Duisburg, Germany
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Ohio Locomotive Crane Co., The, Bucyrus, Ohio.

CRANES — Electric, Industrial, Truck Mounted
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

CRANES—Electric Traveling
Armel, James P., Pittsburgh.
Cleveland Tramrail Div. of The Cleveland Crane & Engrng. Co., Wickliffe, Ohio.
Conco Engineering Works, Div. of H. D. Conkey & Co., Mendota, Ill.
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee, Wis.
Morgan Engineering Co., The, Alliance, O.
Northern Engineering Works, Detroit, Mich.
Robbins & Myers, Inc., Springfield, Ohio.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Gantry
Demag Corp., Duisburg, Germany
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Morgan Engineering Co., The, Alliance, O.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Hand Power
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engrng. Co., Wickliffe, Ohio.
Conco Engineering Works, Div. of H. D. Conkey & Co., Mendota, Ill.
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.
Euclid Crane & Hoist Co., The, Euclid, O.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., Harvey, Ill.

CRANES—Jib
American Monorail Co., The, Cleveland.
Euclid Crane & Hoist Co., The, Euclid, O.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Whiting Corp., Harvey, Ill.

CRANES—Locomotive
American Hoist & Derrick Co., St. Paul, Minn.
Cullen-Friestedt Co., 1303 S. Kilbourn Ave., Chicago.
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Industrial Brownhoist Corp., Bay City, Mich.
Link-Belt Co., 300 West Pershing Road, Chicago, Ill.
Ohio Locomotive Crane Co., The, Bucyrus, O.

CRANES—Monorail
American Monorail Co., The, Cleveland.
Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.
Euclid Crane & Hoist Co., The, Euclid, O.
Northern Engineering Works, Detroit.
Shaw-Box Crane & Hoist Div. Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.
Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

CRANES—Portable
Cawton Fdry. & Mch. Co., Cleveland.

CRANES—Portable Electric
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.
Elwell-Parker Electric Co., The, Cleveland.

JUST BETWEEN US TWO

He Didn't Say "Theirself"

Always eager to improve ourself, we have been giving thought to the broad claim that if people wrote as they speak, the written word would gain in color. We have done much objective listening and are now ready to report that exactly the reverse is true.

We find that impromptu speech is usually halting and repetitious, and, John Steinbeck notwithstanding, it looks bad in print. Those supposedly unstudied utterances of the great that you see here and in the newspapers are no criterion, for in their kindly way the reporters eliminate the double negatives, the fighting tenses and the grievous syntactical sins.

But apparently a new day is dawning. *The New York Times*, tired of grammatical delousing, quotes one of our major captains of industry thus:

> **"Anybody who thinks there are not lots of wonderful opportunities in the future for full employment should give themselves a trip to the New York World's Fair and look at the exhibits in a fundamental and intelligent way."**

Ex Cathedra

A good speaker can, of course, take the curse of a bromide by inflection and timing. As an example, take this redundancy as delivered by Neville Chamberlain:

> *"It must not be taken as part of a deliberate intention to misuse the 'D' notice, because it is quite clear that 'D' notice must not be used for purposes for which it is not intended."*

Spoken with prime ministerial gravity, it may have seemed an oral jewel, but in cold type it limps.

And Who Can Deny?

And while we are at it, we should in fairness include the following gem from your favorite family Journal:

> **"There is, in every industry and almost every company, a variety of jobs which must properly be filled so that the company can function smoothly."**

Of which there can be no possible doubt, no possible doubt whatever.

New Process

> *For half a century, Tottenville (Staten Island) has been residential, except for a plant for melting scrap iron into ingots.—The New Yorker.*

Jitters

Staggered workmen's holidays are minimizing stoppages.—*London market cable to The Iron Age, Aug. 17, p. 97.*

Stopper

There were no **** in the letter to Jimmy—*Pratt & Whitney.*

Internationalist

The day the news broke about the German-Russian pact, the man next to us in the Erie ferryboat opened up his *New York Sun*, carrying in letters a foot high this headline, "BRITISH PARLIAMENT SUMMONED: FRANCE CALLS RESERVISTS TO FLAG." He said, "Hm! Giants 4, Chicago 2."

Orchid

Our Oberleutnant can insist that our horn wear a derby whenever we sound it, but he has no authority to mute this toot by a Wisconsin reader:

> **"I want to acknowledge considerable interest and benefit from your 'This Week on the Assembly Line.' . . . I will watch developments through The Iron Age telescope and beat the automotive news sheets. And if the 'Bull of the Woods' series ever fails, shop men will suffer a relapse."**

Puzzles

Last week's commuter walked 11 minutes and 33 seconds.

Our humble apologies to K. W. (Krupp) Friedrichs for permitting careless proofreading to gum up the answer to his excellent problem about the Arctic hunter. Of course, the hunter walked 3 miles south from his tent at the North Pole, then 5 miles west, and was still only 3 miles from home.

"Angry Reader" was wrong about the monkey-tree-gun problem. J. E. Morelock, v.p. of the Converse Bridge & Steel Co., Chattanooga, proves mathematically, as Thomas Abraham did, that if you aim an elephant gun, a .22, an air rifle and a popgun at a monkey in a tree, and shoot the guns the instant the monkey drops, the monkey will be hit four times at various stages of his drop to the ground.

George N. Benoit says every M.I.T. senior flunked this in an examination:

> *A farmer owns a trapezoidal garden patch which he wishes to divide equally between two sons. The patch is 20 rods long, 1 rod wide at one end and 2 rods wide at the other. He erects a fence parallel to the ends, which divides the plot into equal shares. How long is the fence?*

—A.H.D.

PRODUCTS INDEX

CRANKSHAFTS
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Union Drawn Steel Div. Republic Steel Corp., Massillon, Ohio.

CRANKSHAFTS—Forged
Bay City Forge Co., Erie, Pa.
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.

CRUSHERS—Coal
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CRUSHERS—Steel Turning
American Pulverizer Co., 1439 Macklind Ave., St. Louis, Mo.

CUTTERS—Die Sinking
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Tomkins-Johnson Co., The, Jackson, Mich.

CUTTERS—Keyseating
Davis Keyseater Co., 400 Exchange St. Rochester, N. Y.

CUTTERS—Milling
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland (Ohio) Twist Drill Co., The.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Victor Machinery Exchange, 251 Centre St., N. Y. C.

CUTTING-OFF MACHINES—Abrasives
Tabor Mfg. Co., Phila.

CUTTING-OFF MACHINES—Cold Saw
Espen-Lucas Mch. Wks., Philadelphia.

CUTTING-OFF MACHINES—Pipe or Tubing
Aetna-Standard Engineering Co., The, Youngstown, Ohio.
Bardons & Oliver, Inc., Cleveland.
Landis Mch. Co., Inc., Waynesboro, Pa.

CUTTING AND WELDING APPARATUS—Oxy-Acetylene—See Welding and Cutting Machines and Equipment—Oxy-Acetylene.

CYLINDERS — Compressed Air & Hydraulic
Hannifin Mfg. Co., Chicago.
Tomkins-Johnson Co., The, Jackson, Mich.

CYLINDERS—Seamless
Harrisburg (Pa.) Steel Corp.
Midvale Co., The, Nicetown, Phila., Pa.
National Tube Co. (U. S. Steel Corp Subsidiary), Pittsburgh.

DEGREASING MACHINES—Solvent
Detroit Rex Products Co., Detroit, Mich.

DEOXIDIZERS
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

DESIGNING & DEVELOPING
Torrington (Conn.) Mfg. Co.

DESKS—Steel (Factory)
Sherron Metallic Corp., 1201 Flushing Ave., Brooklyn, N. Y.

DICTATING MACHINES
Dictaphone Corp., 420 Lexington Ave., N. Y. C.

DIE BLOCKS—Drop Hammer
Heppenstall Co., Pittsburgh.
Kropp Forge Co., Chicago, Ill.

DIE CASTING MACHINES
Reed-Prentice Corp., Worcester, Mass.

DIE FILING MACHINES
Harvey Mfg. Corp., 161 Grand St., New York City.

DIE SINKING MACHINES — Automatic and Hand
Cincinnati (Ohio) Milling Mch. Co., The.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

DIES, JIGS, FIXTURES, etc.
Barth Stamping & Mach. Wks., Cleveland.
Boyar-Schultz Corp., 2106 West Walnut St., Chicago, Ill.
Taft-Peirce Mfg. Co., The, Woonsocket, R. I.

DIES—Cast Tool Steel
Advance Foundry Co., The, Dayton, Ohio.

DIES—Pipe Threading
Acme Machinery Co., The, Cleveland.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

DIES—Screw and Thread Cutting
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Greenfield (Mass.) Tap & Die Corp.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Self-Opening Adjustable
Acme Machinery Co., The, Cleveland.
Eastern Mach. Screw Corp., New Haven, Ct.
Jones & Lamson Mch. Co., Springfield, Vt.
Landis Mch. Co., Inc., Waynesboro, Pa.
National Acme Co., The, Cleveland.

DIES—Sheet Metal Working
Cimatool Co., The, Dayton, Ohio.
Worcester (Mass.) Stamped Metal Co., 6 Hunt St.

DIES—Steel Letters and Stamps
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

DOORS & SHUTTERS, Fireproof
Mahon, R. C., Co., Detroit, Mich.
Kinnear Mfg. Co., Columbus, Ohio.

DOORS & SHUTTERS—Steel or Wood Rolling
Kinnear Mfg. Co., Columbus, Ohio.

DRAW BENCHES
McKay Machine Co., The, Youngstown, Ohio.

DRAWN WORK—Metal—See Stampings or Drawings—Metal

DRILL HEADS—Hydraulic
National Automatic Tool Co., Richmond, Ind.

DRILL HEADS—Multiple
Baker Bros., Inc., Toledo, Ohio.

DRILLING MACHINES—Bench
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Heavy Duty
Baker Bros., Inc., Toledo, Ohio.
Barnes Drill Co., 815-831 Chestnut St., Rockford, Ill.

DRILLING MACHINES—Multiple Spindle
Baker Bros., Inc., Toledo, Ohio.
Barnes Drill Co., 815-831 Chestnut St., Rockford, Ill.
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Multiple Spindle Adjustable
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Multiple Spindle Horizontal
Baker Bros., Inc., Toledo, Ohio.
National Automatic Tool Co., Richmond, Ind.

DRILLING MACHINES—Portable Electric
Millers Falls Co., Greenfield, Mass.

DRILLING MACHINES—Portable Pneumatic
Helwig Mfg. Co., St. Paul, Minn.
Warner & Swasey Co., The, Cleveland.

DRILLING MACHINES—Radial
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleveland (Ohio) Punch & Shear Works Co., The.

DRILLING MACHINES—Sensitive
Buffalo (N. Y.) Forge Co., 492 Broadway.
Leland-Gifford Co., Worcester, Mass.

DRILLING MACHINES—Upright
Baker Bros., Inc., Toledo, Ohio.
Barnes Drill Co., 815-831 Chestnut St., Rockford, Ill.
Bryant Machinery & Engineering Co., Chicago.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRILLING MACHINES—Vertical
Baker Bros., Inc., Toledo, Ohio.
Barnes Drill Co., 815-831 Chestnut St., Rockford, Ill.
Cincinnati (Ohio) Bickford Tool Co., The.
Cleereman Mch. Tool Co., Green Bay, Wis.

DRIVES—Gear
Farrel-Birmingham Co., Inc., Buffalo, N. Y.
Mesta Mch. Co., Pittsburgh.

DRIVES—Single & Multiple V-Belts
Allis-Chalmers Mfg. Co., Milwaukee.

DROP FORGINGS—See Forgings—Drop, Iron or Steel

DROP HAMMERS—See Hammers—Drop

DUST COLLECTORS
Abrasive Machine Tool Co., East Providence, R. I.
American Foundry Equipment Co., The, 510 S. Byrkit St., Mishawaka, Ind.
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Mahon, R. C., Co., Detroit, Mich.
Pangborn Corporation, Hagerstown, Md.
Whiting Corp., Harvey, Ill.

ECONOMIZERS
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

ELECTRIC LIGHTING—Industrial
General Electric Co., Cleveland.
General Electric Vapor Lamp Co., Hoboken, N. J.
Westinghouse Electric & Mfg. Co., Lighting Div., Cleveland, Ohio.

ELECTRIC WELDING — See Welding — Electric

ELECTRICAL EQUIPMENT
Allis-Chalmers Mfg. Co., Milwaukee.

ELECTRICAL MACHINERY — Second Hand. (See Clearing House Section)

ELECTRICAL WIRES
Boebling's, John A., Sons Co., Trenton, N. J.

ELECTRODE HOLDERS—Welding
Lincoln Electric Co., The, Cleveland.

ELECTRODES—Resistance Welding
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

ELECTRODES—Welding, Coated
Harnischfeger Corp., 4401 W. National Ave., Milwaukee.
Lincoln Electric Co., The, Cleveland.
Maurath, Inc., 7400 Union Ave., Cleveland.
Metal & Thermit Corp., 120 Broadway, N. Y. C.

ELEVATING & HANDLING DEVICES—Hydraulic
Lyon Iron Works, Greene, N. Y.

ELEVATORS—Material Handling
Link-Belt Co., 300 West Pershing Road, Chicago.

EMERY WHEELS—See Grinding Wheels

ENGINEERS—Consulting and Industrial
Hunt, C. H., Pittsburgh, Pa.
Koppers Co., Engineering & Construction Div., Pittsburgh.
Lindemuth, Lewis B., 134 East 47th St., N. Y. C.

ENGINEERS—Metallurgical
Gathmann Engineering Co., The, Baltimore, Md.

ENGINES—Diesel
Demag Corp., Duisburg, Germany
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES—Gas
Demag Corp., Duisburg, Germany
Worthington Pump & Machinery Corp., Harrison, N. J.

ENGINES—Oil
Worthington Pump & Machinery Corp., Harrison, N. J.

EYELET MACHINES
Waterbury (Conn.) Farrel Foundry & Machine Co., The.

FACERS—Spot
Gairing Tool Co., Detroit.

FACING CLAY
Carborundum Co., The, Perth Amboy, N.J.

FACTORY & PLANT SITES
Zoll, Edward H., 196 Market St., Newark, N. J.

FANS—Ventilating
Buffalo (N. Y.) Forge Co., 492 Broadway.

FEED WATER HEATERS AND PURIFIERS
Harrisburg (Pa.) Steel Corp.

FEEDS—Hydraulic, for Machines
American Engineering Co., Philadelphia.
Oilgear Co., The, 1311 W. Bruce St., Milwaukee.

FELT—Wool Mechanical
American Felt Co., 315 Fourth Ave., N. Y. C.

FENCING—Wire
Pittsburgh (Pa.) Steel Co.

FERROALLOYS
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROCHROME
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROMANGANESE
Bethlehem (Pa.) Steel Co.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Jones & Laughlin Steel Corp., Pittsburgh.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.

FERROMOLYBDENUM
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICO MANGANESE
Ohio Ferro-Alloys Corp., Canton, Ohio.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICON
Cleveland-Cliffs Iron Co., The, Cleveland Ohio.
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.
Ohio Ferro-Alloys Corp., Canton, Ohio.
Samuel, Frank, & Co., Inc., Philadelphia.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSILICON ALUMINUM
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROSPIEGELEISEN
New Jersey Zinc Co., The, 160 Front St., N. Y. C.

FERROTITANIUM
Metal & Thermit Corp., 120 Broadway, N. Y. C.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FERROVANADIUM
Electro Metallurgical Sales Corp., 30 E 42nd St., N. Y. C.
Vanadium Corp. of America, 420 Lexington Ave., N. Y. C.

FIBRE—Sheets, Tubes, Rods, Fabricated Parts
Continental-Diamond Fibre Co., Newark, Delaware.

FILES & RASPS
Atkins, E. C. & Co., Indianapolis, Ind.
Disston, Henry, & Sons, Inc., Philadelphia.
Nicholson File Co., Providence, R. I.

FILING MACHINES
Continental Machines, Inc., 1311 S. Washington Ave., Minneapolis, Minn.

FILTER CLOTH—Asbestos
Johns-Manville Corp., 22 East 40th St., New York City.

FILTERS—Air
Whiting Corp., Harvey, Ill.

FILTERS—Oil
Cuno Engineering Corp., Meriden, Conn.
National Acme Co., The, Cleveland.

FIRE BRICK—Insulating
Babcock & Wilcox Co., The, 85 Liberty St., N. Y. C.

FIRE CLAY
Carborundum Co., The, Perth Amboy, N. J.
Illinois Clay Products Co., Joliet, Ill.

FITTINGS—Brass, Pipe and Tube
Commonwealth Brass Corp., Detroit.

FLANGES—Forged Steel
Harrisburg (Pa.) Steel Corp.
Kropp Forge Co., Chicago, Ill.
Standard Steel Wks. Co., Phila., Pa.

FLANGES—Welded Steel
King Fifth Wheel Co., 5031 Beaumont Ave., Philadelphia.

FLANGING WORK—Carbon and Alloy
Worth Steel Co., Claymont, Del.

FLEXIBLE SHAFT EQUIPMENT
Strand, N. A., & Co., Chicago.

FLOODLIGHTS—Acetylene
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FLOOR PLATES—See Plates—Floor & Cellar Door

FLOORING—Acid Proof
Nukem Products Corp., 68 Niagara St. Buffalo, N. Y.

FLOORING—Monolithic
Carey, Philip, Co., The, Cincinnati, Ohio.
Johns-Manville Corp., 22 East 40th St. New York City.

FLOORING—Open Steel
Blaw-Knox Div. of Blaw-Knox Co., Pittsburgh.
Hendrick Mfg. Co., Carbondale, Pa.
Kerlow Steel Flooring Co., Jersey City, N. J.

FLUORSPAR
Hillside Fluor Spar Mines, Chicago, Ill

FLUX—Soldering (Stainless Steel)
Ruby Chemical Co., Columbus, Ohio.

FLUX—Welding
Linde Air Products Company, The, 30 East 42nd St., N. Y. C.

FORGING MACHINES—Roll
Ajax Mfg. Co., The, Cleveland, Ohio.

FORGING MACHINES—Upset
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.

FORGINGS—Alloy Steel
Heppenstall Co., Pittsburgh.
Kropp Forge Co., Chicago, Ill.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Aluminum
Aluminum Co. of America, Pittsburgh.

FORGINGS—Brass, Bronze or Copper
American Brass Co., The, Waterbury, Conn
Commonwealth Brass Corp., Detroit.
Cramp Brass & Iron Foundries Co., Philadelphia.
Harvey Metal Corp., The, Chicago, Ill.
Titan Metal Mfg. Co., Bellefonte, Pa.
Transue & Williams Steel Forging Corp., Alliance, Ohio.

FORGINGS—Coin Pressed
Rockford (Ill.) Drop Forge Co.

FORGINGS—Drop, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bay City Forge Co., Erie, Pa.
Billings & Spencer Co., Hartford, Conn.
Canton (Ohio) Drop Forging & Mfg. Co.
Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.
Kropp Forge Co., Chicago, Ill.
Laughlin, Thomas, Co., The, Portland, Maine.
Poor & Co., Canton Forge & Axle Wks., Canton, Ohio
Rockford (Ill.) Drop Forge Co.
Transue & Williams Steel Forging Corp., Alliance, Ohio.
Wilcox, D., Mfg. Co., Mechanicsburg, Pa.

FORGINGS—Hollow
Harrisburg (Pa.) Steel Corp.
Kropp Forge Co., Chicago, Ill.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa.

FORGINGS—Hydraulic Press, Iron or Steel
Atlas Drop Forge Co., Lansing, Mich.
Bethlehem (Pa.) Steel Company.
Kropp Forge Co., Chicago, Ill.
Mesta Mch. Co., Pittsburgh.
Midvale Co., The, Nicetown, Phila., Pa.
National Forge & Ordnance Co., Irvine, Pa
Standard Steel Wks. Co., Phila., Pa.

FORGINGS—Magnesium Alloys
Aluminum Co. of America, 1701 Gulf Bldg., Pittsburgh.
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

FORGINGS—Upset
Bethlehem (Pa.) Steel Company.
Kropp Forge Co., Chicago, Ill.
Rockford (Ill.) Drop Forge Co.

FOUNDRY EQUIPMENT & SUPPLIES
Whiting Corp., Harvey, Ill.

FURNACES—Billet or Ingot Heating
Salem (Ohio) Engineering Co.

FURNACES—Brass Melting
Monarch Engineering & Mfg. Co., The, Baltimore, Md.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Electric, Steel Melting
American Bridge Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.
Pittsburgh (Pa.) Lectromelt Furnace Corp.

FURNACES—Enameling
Carborundum Co., The, Perth Amboy, N. J.
General Electric Co., Schenectady, N. Y.

FURNACES—Forging
Holcroft & Co., Detroit.
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Automatic
Holcroft & Co., Detroit.
Leeds & Northrup Co., 4956 Stenton Ave., Philadelphia.
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.
Rockwell, W. S., Co., 50 Church St., N.Y.C
Salem (Ohio) Engineering Co.
Stewart Furnace Div., Chicago Flexible Shaft Co., Chicago.

FURNACES—Heat Treating, Controlled Atmosphere
Lindberg Engineering Co., 228 North Laflin St., Chicago, Ill.